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CALCULATION AND EVALUATION OF SEDIMENT
EFFECT CONCENTRATIONS FOR THE AMPHIPOD
HYALELLA AZTECA AND THE MIDGE *CHIRONOMUS RIPARIUS*

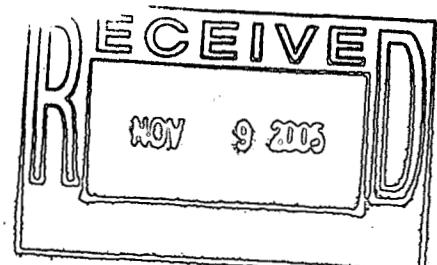
National Biological Service Final Report for
the U.S. Environmental Protection Agency
Great Lakes National Program Office (GLNPO)
Assessment and Remediation of Contaminated
Sediment (ARCS) Project

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Disclaimer

Although the sediment effect concentrations (SECs) can be used as guidance for evaluating contaminated sediment, there is no intent expressed or implied that these SECs represent USEPA or National Biological Service (NBS) criteria. Mention of trade names or commercial products does not constitute endorsement or recommendation for use. The information in this report has been funded in part by the USEPA under Contract Number DW14933874 with the NBS Midwest Science Center, Columbia, MO.

Abstract

Procedures are described for calculating and evaluating sediment effect concentrations (SECs) using laboratory data on the toxicity of contaminants associated with field-collected sediment to the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. SECs are defined as the concentrations of individual contaminants in sediment below which toxicity is rarely observed and above which toxicity is frequently observed. Only a limited number of SECs have been published for freshwater sediments. The objective of the present study was to develop SECs to classify toxicity data for Great Lake sediment samples tested with *Hyalella azteca* and *Chironomus riparius*. This SEC database included samples from additional sites across the United States in order to make the database as robust as possible. Three types of SECs were calculated from these data: (1) Effect Range Low (ERL) and Effect Range Median (ERM), (2) Threshold Effect Level (TEL) and Probable Effect Level (PEL), and (3) No Effect Concentration (NEC). The SECs were calculated using: (1) dry-weight concentrations, (2) dry-weight concentrations normalized to total organic carbon concentrations (for non-ionic organics), or (3) dry-weight concentrations normalized to acid volatile sulfide concentrations (for divalent metals). We were able to calculate SECs primarily for total metals, simultaneously extracted metals, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). The ranges of concentrations in sediment were too narrow in our database to adequately evaluate SECs for butyltins, methyl mercury, polychlorinated dioxins and furans, or chlorinated pesticides.

About 60 to 80% of the sediment samples in the database are correctly classified as toxic or not toxic depending on type of SEC evaluated. The SECs calculated for the entire database were generally as reliable as SECs calculated for the Great Lakes database at classifying both toxic and non-toxic Great Lakes samples in our database. ERMs and ERLs calculated using the entire database are generally as reliable as paired PELs and TELs at classifying both toxic and non-toxic samples in our database. Reliability of the SECs in terms of correctly classifying sediment samples is similar between ERMs and NECs; however, ERMs minimize Type I error (false positives) relative to ERLs and minimize Type II error (false negatives) relative to NECs. Correct classification of samples can be improved by using only the most reliable individual SECs for chemicals (i.e., those with a higher percentage of correct classification). When SECs are used to conduct a preliminary screening to predict the potential for toxicity in the absence of actual toxicity testing, a low number of SEC exceedances should be used to minimize the potential for false negatives; however, the risk of accepting higher false positives is increased. Calculating SECs using dry-weight concentrations vs SECs calculated using sediment concentrations normalized to TOC concentrations for PAHs and total PCBs resulted in similar correct classification of toxicity and similar Type I and Type II error. The range of TOC concentrations in our database was relatively narrow compared to the ranges of contaminant concentrations. Therefore, normalizing dry-weight concentrations to a relatively narrow range of TOC concentrations had little influence on relative concentrations of contaminants among samples.

Our SECs were calculated from toxicity tests with field-collected samples. If a chemical concentration exceeds an SEC generated using data from these tests with field-collected samples, it does not necessarily mean the chemical caused the observed effect. Rather, the SEC is the concentration of a chemical that is associated with the effect. Field-collected sediments typically contain complex mixtures of contaminants. Additional information is needed to identify the specific contaminants that were actually responsible for the toxicity. Confirmation of sediment toxicity due to individual or groups of contaminants can be determined by using Toxicity Identification Evaluation (TIE) procedures or by conducting toxicity tests with spiked sediments. Once the probable cause(s) of sediment toxicity has been identified, better decisions can be made regarding remediation options.

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Acronyms

AET	Apparent Effect Threshold
AOC	Area of Concern
ARCS	Assessment and Remediation of Contaminated Sediments
AVS	Acid Volatile Sulfide
CR14	<i>Chironomus riparius</i> 14-d test
EQP	Equilibrium Partitioning
ERL	Effect Range Low
ERM	Effect Range Median
HA10	<i>Hyalella azteca</i> 10-d test
HA14	<i>Hyalella azteca</i> 14-d test
HA28	<i>Hyalella azteca</i> 28-d test
HS28	<i>Hexagenia</i> spp. 28-d test
LOEC	Low Observable Effect Concentration
MATC	Maximum Acceptable Toxicant Concentration
NEC	No Effect Concentration
NERH	No Effect Range High
NERM	No effect Range Median
NOEC	No Observable Effect Concentration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PEL	Probable Effect Level
SEC	Sediment Effect Concentration
SLC	Screening Level Concentration
TEL	Threshold Effect Level
TOC	Total Organic Carbon
TT28	<i>Tubifex tubifex</i> 28-d test

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Introduction

In support of the United States commitment to the Great Lakes Water Quality Agreement, Section 118 (c)(3) of the Clean Water Act (CWA; added by the Water Quality Act of 1987) authorized the USEPA GLNPO to carry out a 5-year study and demonstration project relating to the control and removal of toxic pollutants in sediments of the Great Lakes. The Water Quality Act of 1987 specified five Great Lakes Areas of Concern (AOC) as requiring priority consideration in conducting demonstration projects: Saginaw Bay, MI; Sheboygan Harbor, WI; Grand Calumet River, IN; Astabula River, OH; and Buffalo River, NY. Results from this Assessment and Remediation of Contaminated Sediment (ARCS) project have been used to develop: (1) methods for evaluating effects of contaminated sediments, (2) Remedial Action Plans (RAPs) for AOCs, and (3) Lake-wide Management Plans (Ross et al., 1992; USEPA, 1994; Fox, 1996).

Over the past decade, a variety studies have reported toxicity associated with field-collected sediments (USEPA, 1994; ASTM, 1995; Burton et al., 1996). However, it is often difficult to evaluate relationships between levels of contamination and toxicity in these and other studies because the sediments typically contain a variety of both organic and inorganic contaminants. Procedures are described in this report for calculating and evaluating a variety of sediment effect concentrations (SECs) using laboratory data on the toxicity of contaminants associated with field-collected sediment to the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. We define SECs as the concentrations of individual contaminants in sediment below which toxicity is rarely observed and above which toxicity is frequently observed.

Only a limited number of SECs have been published for freshwater sediments (Persaud et al., 1992; Batts and Cubbage, 1995). The objective of the present study was to develop SECs to classify toxicity data for Great Lake sediment samples tested with *Hyalella azteca* and *Chironomus riparius*. This SEC database included samples from additional sites across the United States in order to make the database as robust as possible. Three different approaches were used to calculate SECs including: (1) Effect Ranges Low and Median (ERL and ERM; Long and Morgan, 1991), (2) Threshold Effect and Probable Effect Levels (TEL and PEL; MacDonald, 1994; MacDonald et al. 1995; Smith et al., 1996), and (3) No Effect Concentrations (NEC; Kemble et al., 1994). The SECs were calculated using: (1) dry-weight concentrations, (2) dry-weight concentrations normalized to total organic carbon concentrations (for non-ionic organics) or (3) dry-weight concentrations normalized to acid volatile sulfide concentrations (for divalent metals).

For the ARCS project, whole-sediment toxicity tests were conducted with the amphipod *Hyalella azteca* (14- and 28-d tests) and the midges *Chironomus riparius* (14-d test) and *Chironomus tentans* (10-d test; USEPA, 1993; Burton et al., 1996; Table 1 and Appendix 1). Only a limited number of samples were successfully tested with *C. tentans*; therefore, we did not use these data to calculate SECs. Chemistry, benthic community analysis, elutriate toxicity, and mutagenicity

of sediment samples were also evaluated as part of the ARCS project (USEPA, 1993; Burton et al. 1996). Sediments were collected from three Great Lakes Areas of Concern: Indiana Harbor, IN; Buffalo River, NY; and Saginaw River, MI. In addition to the ARCS data, we evaluated toxicity and chemistry data generated with sediments collected from the following sites: (1) Waukegan Harbor, IL (Ingersoll and Nelson, 1990); (2) the upper Mississippi River, MN (Appendix 2); (3) the upper Clark Fork River, MT (Kemble et al., 1994); (4) the Trinity River, TX (Appendix 2); (5) Mobile Bay, AL (Appendix 2); and (6) Galveston Bay, TX (Roach et al., 1993).

Ingersoll et al. (1996) described the major findings of this report as part of a series of papers describing results from the ARCS project including: sediment chemistry, benthic community analysis (Canfield et al., 1996a), toxicity (USEPA, 1993; Hall et al., 1996), mutagenicity (Papoulias and Buckler, 1996; Papoulias et al., 1996), and toxicity ranking (Canfield et al., 1996a; Wildhaber and Schmitt, 1996). Procedures in this series of papers are also described for confirming the cause of sediment toxicity (e.g., Toxicity Identification Evaluations, TIE; Ankley et al., 1996). Smith et al. (1996) also used our data and additional data from North America as part of this series of papers to calculate and evaluate TELs and PELs for freshwater sediments.

Cause and Effect vs. Association and Effect

Our SECs were calculated from toxicity tests with field-collected samples. If a chemical concentration exceeds an SEC generated using data from these tests with field-collected samples, it does not necessarily mean the chemical caused the observed effect. Rather, the SEC is the concentration of a chemical that is associated with the effect. Field-collected sediments typically contain complex mixtures of contaminants. Additional information is needed to identify the specific contaminants that were actually responsible for the toxicity. Confirmation of sediment toxicity due to individual or groups of contaminants or the interactive effects of sediment toxicants can be evaluated by using TIE procedures (Ankley and Thomas, 1992; Ankley et al., 1996) or by conducting toxicity tests with chemicals spiked into sediments (Lamberson and Swartz, 1992). Once the probable cause(s) of sediment toxicity has been identified, better decisions can be made regarding remediation options.

Application of Sediment Effect Concentrations

Ideally, SECs could be used to: (1) interpret historical sediment chemistry data, (2) identify chemicals or areas of concern, (3) identify the need for more detailed studies before an action is taken, (4) identify a potential problem before discharging a chemical, (5) establish a link between a contaminant source and sediment quality, (6) trigger regulatory action, or (7) establish target remediation objectives. The strength of SECs generated using data from studies with individual chemicals spiked into sediment or with an equilibrium partitioning (EQP) approach is that cause and effect relationships can be established (Di Toro et al., 1991; USEPA, 1992). While, all seven of the uses listed above for SECs could be satisfied with either of these approaches, both

the spiked-sediment and EQP approaches were developed primarily for evaluating the effects of individual chemicals. However, contaminated sediments typically contain complex mixtures of chemicals which could act independently, additively, synergistically, or antagonistically. Therefore, the application of SECs developed using these two approaches is often uncertain in field-collected sediments (Swartz and Di Toro, 1996).

One of the main strengths of SECs generated using data from tests conducted with field-collected samples is that the potential effects of mixtures of chemicals are explicitly addressed (Long and Morgan, 1991; USEPA, 1992; MacDonald, 1994; Long et al., 1995; MacDonald et al., 1995). However, there are a number of limitations associated with the co-occurrence-based approaches that have been used to generate SECs including cause and effect is difficult to establish and use of these SECs may be restricted to the geographical area where the sediments were collected. Hence, the last four uses for SECs listed above are difficult to accommodate using co-occurrence-based approaches such as a weight-of-evidence approach (Long and Morgan, 1991). For example, these SECs should not be used independently to establish trigger levels for clean up of sediment. One of the major strengths of SECs developed with data on field-collected sediments is in their use for predicting the potential for toxicity in field-collected sediment samples. A primary use of SECs developed with field-collected sediments should be to provide guidance for determining sites which may require further investigation (Long and Morgan, 1991; MacDonald, 1994). Moreover, the ability of any sediment toxicity test or SEC to predict benthic community effects should be considered before any approach is used to routinely evaluate sediment quality (Canfield et al., 1994; 1996a,b).

Regardless of the intended use, SECs should be evaluated relative to their potential to:

- (1) correctly classify toxic samples as toxic (toxic sample that exceeds SEC [hit]),
- (2) correctly classify non-toxic samples as not toxic (non-toxic sample that does not exceed SEC [no hit]),
- (3) incorrectly classify non-toxic samples as toxic (Type I error; false positive; non-toxic sample that exceeds SEC [hit]), and
- (4) incorrectly classify toxic samples as not toxic (Type II error; false negative; toxic sample that does not exceed SEC [no hit]).

Methods

The following steps were taken to develop the database: (1) chemistry and toxicity data were generated, (2) samples were classified as "toxic" or "not toxic" based on statistical analyses of the toxicity tests, (3) toxic samples were classified as "effects" or "no concordance" based on chemistry, (4) minimum data requirements were established, and (5) SECs were calculated. SECs were calculated for the following tests: (1) 14-d *C. riparius* [CR14], (2) 14-d *H. azteca* [HA14], and (3) 28-d *H. azteca* [HA28] (Table 1). Chemical concentrations were used to calculate SECs were normalized to: (1) dry weight, (2) total organic carbon (for non-ionic organics; Di Toro et al., 1991), or (3) AVS (for divalent metals; Di Toro et al., 1990). Calculations and graphics were performed using SAS version 6.08 (SAS, 1992).

Toxicity Testing

Toxicity tests with the amphipod *Hyalella azteca* were conducted for 10 to 32 d following procedures outlined in Ingersoll and Nelson (1990), USEPA (1994), and ASTM (1995). Tests were generally started within 3 weeks of sediment collection. The control sediment was a fine silt- and clay-particle size soil obtained from an agricultural area. Twenty amphipods (less than 14-d old at the start of the tests) were exposed in 200 ml of sediment with 800 ml of overlying water in 1-L beakers. Four replicate beakers were tested at 20°C on a 16L:8D photoperiod at a light intensity of about 50 to 100 foot candles. Overlying water was renewed daily and the amphipods were fed a suspension of Purina® Rabbit Chow three times a week. Endpoints measured at the end of the amphipod tests were survival, growth (as length), or sexual maturation. Toxicity tests with the midge *Chironomus riparius* were conducted for 13 to 14 d using similar procedures to those used in the tests with amphipods except midges were <48-h old at the start of the tests and midges were fed a mixture of algae, Cerophyl®, and Hartz Dog Treats® daily. Endpoints measured at the end of the midge tests were survival and growth (as length).

Statistical analyses were conducted using one-way analysis of variance with mean separation. For responses in which variance among treatments were heterogenous, rank analysis was performed and differences between means were determined using a t-test on ranked means. Percent survival and maturation data were arcsin transformed before analysis. A sample was designated as "toxic" in a replicated treatment if there was a significant reduction in survival, growth, or maturation relative to the response in the control sediment ($p < 0.05$). A sample was designated as toxic in a non-replicated treatment if there was over a 50% reduction in the response relative to the control sediment (10- to 13-d *H. azteca* or *C. riparius* tests with sediments from Waukegan Harbor and the Trinity River).

SECs were calculated for the following tests: (1) 14-d *C. riparius* [CR14], (2) 14-d *H. azteca* [HA14], and (3) 28-d *H. azteca* [HA28]. For calculation of SECs, the following data were

combined: (1) 10-d with 14-d *H. azteca*, (2) 29- to 32-d with 28-d *H. azteca*, and (3) 13-d with 14-d *C. riparius*.

Appendices 1 and 2b lists the physical and chemical measurements made on each set of sediment samples. Physical characterizations included organic carbon content, water content, and particle size. Chemical characterizations included total metals (Ag, As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Zn), organometals (butyltins and methyl mercury), acid volatile sulfide (AVS) and simultaneously extracted metals (SEM), chlorinated pesticides, total polychlorinated biphenyls (PCBs), polychlorinated dioxins and furans, or polycyclic aromatic hydrocarbons (PAHs). Metal concentrations in pore water were also measured in selected samples (USEPA, 1993).

Sediment toxicity data were obtained for the sites listed below (Table 1 and Appendices 1 and 2b). Suspected toxicants were mixtures of metals and organic compounds except for the samples from the upper Clark Fork River where suspected toxicants were primarily As, Cd, Cu, Pb, and Zn.

Great Lakes ARCS: Sediments were collected from three Great Lakes Areas of Concern: Indiana Harbor (up to 8 samples tested in August 1989), Buffalo River (up to 11 samples tested in October 1989), and Saginaw River (up to 8 samples tested during Survey 1 in December 1989 and up to 16 samples tested during Survey 3 in June 1990). Toxicity tests were conducted with *H. azteca* (14- and 28-d tests) and *C. riparius* 14-d test). All of the Indiana Harbor samples were extremely toxic to amphipods in the 14-d test. Therefore, a 28-d test with amphipods was not conducted. We assumed for the calculation of SECs that Indiana Harbor samples toxic to amphipods in a 14-d test would also be toxic in a 28-d test.

Waukegan Harbor: Toxicity tests were conducted with 4 sediment samples from Waukegan Harbor, IL in November 1987 (*H. azteca* 10- and 29-d tests, *C. riparius* 13-d test).

Upper Mississippi River: Toxicity tests were conducted with 5 sediment samples from the upper Mississippi River near Minneapolis, MN in September 1987 (*H. azteca* 32-d test).

Upper Clark Fork River: Sediment samples were collected from Milltown Reservoir (8 samples tested in July 1991) and the Clark Fork River, MT (7 samples tested in September 1991). Toxicity tests were conducted with *H. azteca* (28-d test) and *C. riparius* (14-d test).

Trinity River: Toxicity tests were conducted with 5 sediment samples from the Trinity River, near Dallas, TX in June 1988 (*H. azteca* 10- and 32-d tests).

Mobile Bay: Toxicity tests were conducted with 6 sediment samples from Mobile Bay, AL in March 1988 (*H. azteca* 28-d test). The test was conducted under static conditions with 10% salinity in the overlying water.

Galveston Bay: Toxicity tests were conducted with 5 sediment samples from Galveston Bay, TX in July 1990 (*H. azteca* 28-d test). The test was conducted under static conditions with 10‰ salinity in the overlying water.

Classification of Effects and Minimum Data Requirements for Reporting SECs

To increase the likelihood that associations between sediment chemistry and toxicity would be observed, the data were screened to determine if at least a 10-fold difference in concentration for at least one chemical among the samples was met from each site (Long and Morgan, 1991; MacDonald, 1994). The chemicals measured in each sample were classified in terms of their association with the observed toxicity. Each of the chemicals in the toxic samples were classified as an "effect" or "no concordance" depending on whether the ratio of the concentration in the sample to the mean concentration in the non-toxic samples was >1 or ≤ 1 . Concentrations of chemicals in non-toxic samples were designated as "no effects". Samples designated with the no concordance descriptor were also included with the no-effect samples for calculation of SECs. Long and Morgan (1991), MacDonald (1994), Long et al. (1995), MacDonald et al. (1995), and Smith et al. (1996) used a similar designation; however, they considered a chemical to be associated with a toxic effect only if the mean concentration in toxic samples at a site was at least two fold greater than the mean concentration in non-toxic samples at a site. We chose to use a ratio of >1 instead of >2 to classify a sample as an "effect" in order to minimize Type II error (toxic sample classified as not toxic). We reported an SEC of a chemical in Appendices 3 and 4 only if: (1) five or more of the samples were toxic for the chemical and (2) the number of toxic samples with concentrations above the SEC was greater than the number of toxic samples with concentrations below the SEC.

Calculation of Effect Range Low (ERL) and Effect Range Median (ERM): We calculated ERLs and ERMs using procedures described by Long and Morgan (1991) and Long et al. (1995). Our ERLs and ERMs are calculated for individual tests (e.g., the *H. azteca* 28-d test) in order use consistent endpoints for determining a toxic response. In contrast, Long and Morgan (1991) merged data from about 75 sources. These sources included marine and freshwater field surveys, spiked-sediment tests, and EQP. Effect ranges were calculated by Long et al. (1995) for 9 metals, 13 individual PAHs, 3 groups of PAHs, and 3 synthetic organic contaminants. Strengths of the Long et al. (1995) approach include: (1) ranges instead of absolutes (e.g., AET) are calculated, (2) a preponderance of evidence from diverse sources is used to generate the ranges (e.g., weight of evidence), and (3) probability of observing effects can be estimated. Limitations to the Long et al. (1995) approach include: (1) the quality of the data was variable, (2) different types of data were merged (e.g., acute lethality and benthic community structure were combined to calculate effect ranges), (3) concentrations were calculated on a dry-weight basis (data on sediment organic carbon and AVS concentrations were not available for all data sets), and (4) no-effect data are not used in the calculation of ERLs or ERMs.

Long et al. (1995) calculated ERLs and ERMs using the following procedure. Concentrations observed or predicted by different methods to be associated with effects were sorted in ascending order, and the lower 10 percentile (ERL) and 50 percentile (ERM) effect concentrations were calculated. An ERL was defined by Long and Morgan (1991) and Long et al. (1995) as the concentration of a chemical in sediment below which adverse effects were rarely observed or predicted among sensitive species. An ERM was defined as the concentration of a chemical in sediment above which effects are frequently or always observed or predicted among most species. Use of percentiles minimized the influence of single data points (e.g., potential outliers associated with AETs) on SECs. No-effect data were used to evaluate the reliability of ERLs and ERMs calculated using only effect data (Long et al., 1995). We chose to calculate ERLs using the 15 percentile rather than using the 10 percentile of effects to reduce the potential for Type II error (false negatives; MacDonald et al. (1995; see below)).

Calculation of Threshold Effect Level (TEL) and Probable Effect Level (PEL): We calculated TELs and PELs using procedures described by MacDonald (1994) and MacDonald et al. (1995). Our TELs and PELs are calculated for individual tests (e.g., a *H. azteca* 28-d test) in order use consistent endpoints for determining a toxic response. MacDonald (1994) and MacDonald et al. (1995) calculated TELs and PELs by expanding two to three fold the database originally developed by Long and Morgan (1991) and by excluding freshwater data. Effect ranges were calculated by MacDonald et al. (1995) for 9 metals, 7 pesticides, 13 individual PAHs, 3 groups of PAHs, total PCBs, and one phthalate ester. A similar procedure was used to calculate freshwater TELs and PELs for 8 metals, 6 individual PAHs, total PCBs, and 8 pesticides (Smith et al., 1996). Strengths and limitations to this approach are similar to the ERL/ERM approach. However, calculation of TELs and PELs take both effect and no-effect data into consideration.

MacDonald et al. (1995) and Smith et al. (1996) calculated TELs and PELs using the following procedure. Concentrations observed or predicted by different methods to be associated with effects were sorted and the lower 15 percentile (ERL) and 50 percentile (ERM) concentrations of the effects data set were calculated. In addition, the 50 percentile (No Effect Range Median; NERM) and 85 percentile (No Effect Range High; NERH) concentrations of the no effects data set were calculated. The TEL was calculated as the geometric mean of the ERL and NERM, whereas the PEL was calculated the geometric mean of the ERM and NERH. The geometric mean was used rather than the arithmetic mean because the two data sets are typically not normally distributed. An analogous procedure has been used to calculate Maximum Acceptable Toxicant Concentrations (MATCs) from the geometric mean of the no-observable- and low-observable-effect concentrations (LOEC and NOEC; MacDonald, 1994). For each of the values (ERL, ERM, NERM, and NERH), a series of percentiles was evaluated to optimize correct classification of toxicity using the TELs and PELs (MacDonald, 1994).

A TEL (or ERL) is assumed to represent a concentration below which toxic effects are rarely observed. A PEL (or ERM) is assume to represent a concentration above which toxic effects are frequently observed. The range between the TEL and PEL (or between the ERL and ERM) is

assume to represent the range in which effects are occasionally observed (MacDonald, 1994). Probability of toxic effects can be calculated within each range. For example, only 6% of the cadmium (Cd) concentrations reported by MacDonald (1994) below the TEL of 0.68 ug/g were associated with adverse effects, whereas over 71% of the Cd concentrations above the PEL of 4.21 ug/g were associated with toxic effects. These Cd data indicate that exceeding the PEL may be associated with unacceptable effects. In contrast, 3% of the nickel (Ni) concentrations below the TEL of 15.9 ug/g and 9% of the Ni concentrations above the PEL of 42.8 ug/g were associated with toxic effects. These Ni data indicate that it may be more difficult to adequately determine unacceptable levels of Ni using this approach (e.g., toxic concentrations of Ni were not observed in the MacDonald (1994) database).

The approaches described by Long et al. (1995) and MacDonald et al. (1995) have been used by NOAA (Long and Morgan, 1991), Environment Canada (CCME, 1995), and the state of Florida (MacDonald, 1994) to derive sediment quality guidelines. Additional organizations that are considering the use of these approaches to derive sediment quality guidelines include the state of California (Lorenzato et al., 1991), the International Council for Exploring the Sea, and the National Rivers Authority in the United Kingdom (R. Fleming, WRc, Marlow, Bucks, United Kingdom, personal communication).

Calculation of No Effect Concentration (NEC): We also calculated No Effect Concentrations (NECs) which are analogous to Apparent Effect Thresholds (AETs). An AET is defined as the sediment concentration of a given chemical above which statistically significant effects (e.g., sediment toxicity) are always observed (Berrick et al., 1988). If any chemical exceeds its AET for a particular response, an adverse effect is expected for that response. If all concentrations of chemicals are below their AET for a particular response, then no adverse effect is expected. The AET approach has been applied to contaminated sediment in marine environments (e.g., in the Puget Sound, Barrick et al. (1988) and in California, Becker et al. (1989)); however, the AET approach has rarely been used to evaluate freshwater sediments (Kemble et al., 1994).

A NEC is calculated as the maximum concentration of a chemical in a sediment that did not significantly adversely affect the particular response (e.g., survival, growth, or maturation) compared to the control. We chose to use the term NEC instead of AET because: (1) we calculated NECs for whole-sediment or pore-water concentrations, while AETs are typically calculated for just whole-sediment concentrations; (2) a minimum of 25 to 50 samples is recommended for calculating an AET and we used <25 samples to calculate some of our NECs; and (3) we calculated effects relative to a control sediment, whereas AETs are typically calculated relative to reference sediments.

Evaluation of Sediment Effect Concentrations

If the concentration of a chemical measured in a toxic sample exceeded an SEC, the chemical in that sample was classified as a "hit" for that SEC. Our SECs were then evaluated relative to their

potential to: (1) correctly classify toxic samples as toxic (toxic sample that exceeds SEC [hit]), (2) correctly classify non-toxic samples as not toxic (non-toxic sample that does not exceed SEC [no hit]), (3) incorrectly classify non-toxic samples as toxic (Type I error; false positive; non-toxic sample that exceeds SEC [hit]), or (3) incorrectly classify toxic samples as not toxic (Type II error; false negative; toxic sample that does not exceed SEC [no hit]). The SECs were evaluated relative to their: (1) reliability in terms of correctly classifying the toxicity of sediment samples within the data set, (2) predictive ability for correctly classifying the toxicity of sediment samples from independent data sets, and (3) comparability within the data set or to other published SECs such as AET, ERM, PEL, or EQP values.

Results and Discussion

Toxicity of Sediment Samples

The percentage of sediment samples identified as toxic (e.g., significant reduction in survival, growth, or maturation relative to the control) in each sediment test are listed in Table 1. Survival or growth of *C. riparius* in 14-d tests (CR14) were significantly reduced in 26% of the 42 samples tested. In the CR14 tests when both survival and growth were measured, survival (24%) was reduced more frequently than growth (9%). Sediments from the Clark Fork River (7%) were less toxic in the CR14 test than sediments from the Great Lakes (37%). Survival, growth, or maturation of *H. azteca* in 14-d tests (HA14) were reduced in 41% of the 32 samples tested. In the HA14 test, survival (25%), growth (20%), and maturation (24%) were reduced in a similar percentage of samples. None of the Trinity River samples were toxic; however, 48% of the Great Lakes samples were toxic in the HA14 test. Survival, growth, or maturation of *H. azteca* in the 28-d tests (HA28) were reduced in 39% of the 62 samples tested. In the HA28 test, survival (26%) and growth (34%) were reduced in a higher percentage of samples compared to maturation (11%). None of the upper Mississippi River, Trinity River, or Mobile Bay samples were toxic; however, 48 to 60% of the Great Lakes, Clark Fork River, or Galveston Bay samples were toxic in the HA28 test.

The percentage of paired tests or paired endpoints identifying samples as toxic are listed in Table 2. The CR14 test seldom identified toxic samples that were not identified as toxic in the HA14 or HA28 tests. When CR14 and HA28 tests were conducted concurrently, both tests identified 24% of the samples as toxic and 48% of the samples as not toxic (N=42). An additional 26% of the samples were toxic only in the HA28 test and only an additional 2% of the samples were toxic in the CR14 test. Survival (N=42) or growth (N=34) endpoints identified a higher percentage of samples as toxic in the HA28 test compared to the CR14 test.

When HA14 and CR14 tests were conducted concurrently, both tests identified 37% of the samples as toxic and 52% of the samples as not toxic (N=27). An additional 10% of the samples were toxic only in the HA14 test and no additional samples were toxic in the CR14 test. The survival endpoint (N=27) identified a similar percentage of samples as toxic in both tests. The growth endpoint (N=19) identified a higher percentage of samples toxic in the HA14 test (21%) compared to the CR14 test (5%).

The HA28 test seldom identified toxic samples that were not identified as toxic in the HA14 test. When HA14 and HA28 tests were conducted concurrently, both tests identified 34% of the samples as toxic and 53% of the samples as not toxic (N=32). Both tests identified an additional 6% of the samples as toxic. Survival or growth endpoints identified a similar percentage of samples as toxic in both tests. However, the majority of the samples used to make these comparisons were highly contaminated. We have not compared responses in HA14 vs HA28 tests using moderately contaminated samples. Additional exposures conducted with moderately

contaminated sediment may exhibit a higher percentage of sublethal effects in the HA28 test compared to HA14 test (Kemble et al. 1994).

When both survival and growth were measured in the CR14 test (N=34), 6% of the samples reduced both survival and growth, 6% reduced survival only, 3% reduced growth only, and 85% did not reduce survival or growth. When both survival and growth were measured in the HA14 test (N=25), only 6% of the samples reduced both survival and growth; however, 20% reduced survival only, 16% reduced growth only, and 60% did not reduce survival or growth. Hence, if survival was the only endpoint measured in a HA14 test, 16% of the toxic samples would be missed. Similar percentages are also evident for the HA28 tests. When both survival and growth were measured in the HA28 test (N=44), 16% of the samples reduced both survival and growth, 14% reduced survival only, 18% reduced growth only, and 52% did not reduce survival or growth.

The endpoint comparisons in Table 2 represent only samples where both survival and growth could be measured. If a sample was extremely toxic, it would not be included in this comparison since growth could not be measured. Moderately contaminated sediments that did not severely reduce survival or maturation could have reduced growth. For example, in the HA28 test with sediments from the Clark Fork River, growth was a more sensitive endpoint compared to survival or maturation. Only 13% of the samples reduced survival and 20% of the samples reduced maturation; however, growth was reduced in 53% of the samples.

In summary, both survival and growth endpoints can provide unique information for assessing sediment toxicity and should be measured in either HA14 or HA28 tests. Using CR14 test, only one additional sample was identified as toxic compared to responses in the HA14 or HA28 tests. A primary consideration in selecting an organism for toxicity testing should be its ability to identify toxic samples (Burton et al., 1996). In future evaluations, it may be a more efficient use of resources to test additional samples with *H. azteca* alone rather than testing fewer sediments using both *H. azteca* and *C. riparius*.

Calculation and Evaluation of SECs

The SECs calculated from our database are listed by chemical, test type, and sample type based on dry-weight concentrations (Appendix 3a for the entire database or Appendix 3b for the Great Lakes database) or based on sediment concentrations normalized to total organic carbon concentrations (TOC; Appendix 3c for the entire database or Appendix 3d for the Great Lakes database). Data are grouped by chemical, test type, sample type, toxicity response, and concentration (in ascending order) calculated using dry-weight concentrations (Appendix 4a) or to sediment concentrations normalized to TOC concentrations (PAHs or PCBs; Appendix 4b).

We were able to calculate SECs primarily for total metals, simultaneously extracted metals (SEM metals), total PCBs (for the HA28 test), and PAHs. The ranges of concentrations in the samples

were too narrow or there were too few measured concentrations in our database to adequately evaluate SECs for butyltins, methyl mercury, polychlorinated dioxins and furans, PCBs (for the CR14 or HA14 tests), or chlorinated pesticides (i.e., not reported (NR) in Appendix 3a to 3d). An unreliable SEC for individual chemicals listed in Appendices 3 and 4 is denoted with an "@" (e.g., less than five of the samples were designated as toxic for the chemical or the number of toxic samples with concentrations below the SEC was greater than the number of toxic samples with concentrations above the SEC). See for example the unreliable NEC for total copper denoted with an @ for the CR14 test in Appendix 3a. The SECs for a particular chemical listed in Appendix 3 vary considerably in ability to make correct or incorrect classifications of toxic or non-toxic samples. For example, correct classification of samples with individual SECs typically clustered at 60 to 80% correct. Type I (false positives) and Type II (false negatives) error for individual SECs ranged from 0 to 50% depending on the type SEC (i.e., Figure 1 to 5).

The following section discusses some applications of the database for deriving SECS for classifying the toxicity of samples: (1) Great Lakes vs the entire database, (2) ERMs and ERLs vs PELs and TELs, (3) NECs vs other SECs, (4) dry-weight vs TOC normalization for PAHs and total PCBs, (5) whole-sediment vs pore-water metal concentrations, (6) total metal vs SEM metal concentrations, and (7) calculation of observed and predicted toxicity based on the minimum number of exceedances of SECs. Additional sections of the report evaluate: (1) predictive ability of our SECs, (2) comparability of our SECs to published SECs, and (3) confirming causality of SECs. Additional applications of the database may be of interest to the reader. A copy of the SAS (1992) programs used to manipulate the database can be obtained from the authors.

Great Lakes vs the Entire Database: Initially, the objective of this report was to develop SECs to classify toxicity data for Great Lake sediment samples tested with *Hyalella azteca* and *Chironomus riparius* (Appendix 3b and 3d). However, the database was expanded to include samples from additional locations (Appendix 3a and 3c). This section of the report evaluates the comparability and reliability of SECs calculated using just the Great Lakes database vs SECs calculated using the entire database (Figure 1 to 5). Comparability was evaluated by plotting the ratio of concentrations for two similar types of paired SECs (e.g., Figure 1a to 5a). Reliability was evaluated by plotting the ability of two similar types of paired SECs to: (1) correctly classify samples (e.g., Figure 1b to 5b), (2) incorrectly classify non-toxic samples as toxic (hit; Type I error; false positive; Figure 1c to 5c), and (3) incorrectly classify toxic samples as not toxic (no hit; Type II error; false negative; Figure 1d to 5d).

The ERM-Gs, PEL-Gs, ERL-Gs, and TEL-Gs calculated using just the Great Lakes database (GL SECs in Appendix 3b) tended to be higher than the paired ERMs, PELs, ERLs, and TELs calculated using the entire database (all-data SECs; Appendix 3a; Figure 1a to 4a). However, these GL SECs were within 2X of the paired all-data SECs. This indicates that the toxicity observed in the additional samples (i.e., outside the Great Lakes) occurred at lower sediment concentrations. An exception to the trend of higher GL SECs was the HA14 ERMs and ERLs

which were identical using the two databases (Figure 1a and 3a). This was expected since the additional HA14 data were non-toxic samples from the Trinity River (Table 1) and ERLs and ERMs are calculated using only toxic samples. For the HA28 test, the all-data NECs were often higher than the paired GL NECs (NEC-Gs; Figure 5a). This is not surprising since NECs by definition can only increase with additional data.

Even though the concentrations of the paired SECs differed (Figure 1a to 5a), the percentage of the Great Lakes samples correctly classified by paired GL SECs and all-data SECs were similar (Figure 1b to 5b). A high percentage ($\geq 77\%$) of these paired comparisons of correct classifications were within a range of $\pm 20\%$ for all three toxicity tests. For the CR14 and HA14 tests, Type I error (Figure 1c to 5c) and Type II error (Figure 1d to 5d) were generally consistent between paired SECs. For the HA28 test, Type I error tended to be higher and Type II error tended to be lower for all-data SECs compared to paired GL SECs. Exceptions to these trends in the HA28 test were Type I error tended to be lower (Figure 5c) and Type II error tended to be higher (Figure 5d) for all-data NECs compared to paired NEC-Gs. In summary, these analyses indicate the all-data SECs are generally as reliable as the GL SECs at classifying both toxic and non-toxic Great Lakes samples in our database. Therefore, the remaining sections of the report evaluate SECs calculated using the entire database.

ERMs and ERLs vs PELs and TELs: The ERMs or ERLs for the entire database tended to be higher than the paired PELs (Figure 6a) or TELs (Figure 7a) for the entire database. This resulted from a lower distribution of concentrations in non-toxic samples (e.g., low NERM or NERH) relative to the ERM or ERL. An exception to this trend was uniform distribution of ERMs and PELs for the HA28 test (Figure 6a). The SECs were typically $\pm 2X$ of their paired SEC (Figure 6a and 7a). Although the concentrations of the paired ERMs and PELs differed, the percentage of samples correctly classified by paired SECs was similar for all three tests ($\geq 96\%$; Figure 6b). ERLs tended to correctly classify a higher percentage of samples compared to paired TELs (Figure 7b). Type I error was generally lower and Type II error tended to be higher with ERMs and ERLs compared to paired PELs (Figure 6c and 6d) or TELs (Figure 7c and 7d). These analyses indicate the ERMs and ERLs are generally as reliable as the PELs and TELs at classifying both toxic and non-toxic samples in our database.

The ERMs and PELs were higher than their respective paired ERL (Figure 8a) or TEL (Figure 9a). This was expected since ERMs and PELs by definition can only be higher than paired ERLs or TELs. The percentage of samples correctly classified by ERMs and PELs (Figure 8b and 9b) and the Type II error (Figure 8d and 9d) were higher compared to the paired ERLs and TELs. In contrast, the Type I error was higher for ERLs and TELs compared to their respective paired ERM (Figure 8c) or PEL (Figure 9c). These analyses indicate the ERMs and PELs are more reliable than ERLs and TELs at correctly classifying samples, but ERLs and TELs minimize Type II error (toxic sample classified as no hit).

NECs vs other SECs: The NECs were typically higher than their respective paired ERM (Figure 10a) or ERL (Figure 11a). Again, this was expected since NECs (the high no effect concentration) would typically be greater than the 50- (e.g., ERM) or 15- (e.g., ERL) percentile effect concentration. The percentage of samples correctly classified by NECs were similar to paired ERMs (Figure 10b) and higher than paired ERLs (Figure 11b). Type I error associated with NECs were typically lower compared to the paired ERMs (Figure 10c) or ERLs (Figure 11c). However, Type II error (toxic sample classified as no hit) were typically higher with NECs compared to either paired ERMs (Figure 10d) or ERLs (Figure 11d). These analyses indicate the overall reliability of ERMs is similar to NECs; however, ERMs and ERLs both minimize Type II error compared to NECs.

Dry-weight vs (TOC) Normalization for PAHs and Total PCBs: The SECs for PAHs and total PCBs were calculated using dry-weight concentrations (Appendices 3a, 3b, 4a) or calculated using sediment concentrations normalized to TOC concentrations (Appendices 3c, 3d, 4b). The percentage of samples correctly classified using SECs calculated using dry-weight concentrations tended to be higher than the paired SECs calculated using sediment concentrations normalized to TOC concentrations (Figure 12a to 14a). Type I error (Figure 12b to 14b) and Type II error (Figure 12c to 14c) were generally consistent between paired SECs. Exceptions to these trends were Type I error was generally lower for ERMs calculated using dry-weight concentrations compared to paired ERMs calculated using sediment concentrations normalized to TOC concentrations (Figure 12b) and Type II error was generally lower for NECs calculated using dry-weight concentrations compared to paired NECs calculated using sediment concentrations normalized to TOC concentrations for the HA14 test (Figure 14c).

Whole-sediment vs Pore-water Metals: The percentage of the samples correctly classified by ERMs, NECs, and ERLs calculated using pore-water concentrations of metals tended to be slightly lower than paired SECs calculated using total metal concentrations (Figure 15a, 16a, 17a) or calculated using SEM metal concentrations (Appendix 3a). No consistent trends was evident for Type I error between paired SECs among tests (Figure 15b, 16b, 17b). Type II error was generally lower for total-metal SECs compare to paired pore-water metal SECs (Figure 15c, 16c, 17c). Exceptions to this trend were lower Type II error associated with pore-water NECs for the CR14 test. In summary, these analyses indicate for metals, SECs calculated using pore-water concentrations did not improve reliability compared to SECs calculated using total-metal concentrations.

Total Metals vs SEM Metals: The percentage of the samples correctly classified by ERMs, NECs, and ERLs calculated using total-metal concentrations tended to be higher than paired SECs calculated using SEM-metal concentrations (Figure 18a, 19a, 20a). No consistent trends were evident for Type I error associated with paired SECs among the tests (Figure 18b, 19b, or 20b); however, Type II error was generally lower for total-metal SECs compare to paired SEM-metal SECs (Figure 18c, 19c, 20c). In summary, these analyses indicate for metals, SECs

calculated using SEM-metal concentrations did not improve reliability compared to SECs calculated using total-metal concentrations.

Acid-volatile sulfide (AVS) has been demonstrated to control pore-water concentrations and bioavailability of divalent metals in 10-d toxicity and bioaccumulation exposures. Divalent metals in sediment with a molar SEM/AVS ratio ≤ 1.0 would not be predicted to be toxic or to be bioaccumulated by aquatic organisms (Di Toro, 1990). Concentrations of AVS were determined for only 18 samples from the Great Lakes and 13 samples from the Clark Fork River (CFR; Appendix 4a). Ratios of SEM/AVS were well below 1.0 for all Great Lakes samples and only 5 of 13 CFR samples exceeded SEM/AVS ratios of 1.0. Of the 5 CFR samples with SEM/AVS ratios > 1.0 , only 1 sample was toxic in the CR14 test and 4 samples were toxic in the HA28 test. Hence, there was an insufficient number of samples in the database to calculate SECs for exceedances of SEM/AVS ratios. Samples were often toxic at SEM/AVS ratios < 1.0 suggesting contaminants other than metals may have caused the toxicity. SECs calculated using total-metal concentrations often correctly classified $> 60\%$ of the samples. These results indicate metals may have been associated, but did not cause the toxicity observed in the Great Lakes samples with SEM/AVS ratios < 1.0 .

Calculation of the Minimum Number of Exceedances of SECs: A second approach used to evaluate reliability of SECs was to plot observed and expected toxicity of samples based on the minimum number of exceedances of SECs. For example, Figure 21a is a plot of the percentage of samples correctly classified as a function of the minimum number of individual ERMs exceeded. In the CR14 test, if an exceedance of an ERM for only one chemical is used to classify a sample as a hit, about 65% of the samples were correctly classified as toxic or not toxic and about 30% of the non-toxic samples were classified as hits (Type I error; false positive). However, the Type II error was only 5% (toxic samples classified as no hit; false negative). As the criteria for a hit is increased to 2 or more ERM exceedances per sample in the CR14 test, the percentage of samples correctly classified increased to about 80%, Type II error increased to almost 20%, and Type I error decreased to $< 5\%$. In the HA14 test, the highest correct classification of about 75 to 85% occurs in the range of about 2 to 4 ERM exceedances (Figure 21a). In this range, Type I and Type II errors are equal (i.e., cross over of the not toxic hit line with the toxic/no hit line). In contrast, the highest correct classification of about 70% for the HA28 test occurs across 3 to 10 exceedances with Type I equal to Type II error at about 7 exceedances.

Figure 21b plots correct classification of samples as a function of ERM exceedances using only those chemicals for which individual ERMs correctly classify $\geq 60\%$ of the samples (Figure 21a used all the individual ERMs listed in Appendix 3a regardless of percentage correct classification). The number of ERMs used in the calculations remained the same for the CR14 and HA14 tests (Figure 21a vs 21b); however, selecting a criterion of 60% reduced the number of ERMs used in the calculations from 25 to 20 in the HA28 test. As a result, correct classification

increased by about 5 to 10% across 1 to 10 exceedances in the HA28 test (Figure 21a vs 21b). This increased correct classification resulted from a reduction in Type I error (not toxic hit).

Selecting a criterion of 70% correct classification for individual ERMs reduced the number of ERMs used in the calculation from 22 to 21 in the CR14 and HA14 tests, and from 25 to 9 in the HA28 test (Figure 21a vs 21c). At 1 exceedance, correct classifications increased in all three tests by about 10 to 20% and both Type I and Type II error were only about 10% (Figure 21a vs 21c). However, increasing the minimum number of exceedances decreased correct classifications of samples in the HA28 test (Figure 21c). This drop in correct classification results from increased Type II error (toxic/no hit) when fewer ERMs are used in the calculation (Figure 21a vs 21c).

In summary, correct classification of samples can be improved by using individual ERMs with a higher percentage of correct classification. For example, using a 70% criterion for selection of ERMs, only 1 ERM had to be exceeded in any of the three tests to achieve about 80 to 90% correct classification of samples with only about 10% Type I and Type II errors. By lowering the criterion to 60% for selection of ERMs, exceeding 2 to 5 ERMs still resulted in about 70 to 80% correct classification of samples.

Figure 22a plots correct classification of samples as a function of ERL exceedances (regardless of percentage correct classification by individual ERLs in Appendix 3a). Type II error (false negatives) remains relatively low (<10%) across the range of 1 to 10 ERL exceedances. The highest correct classification of about 60 to 70% occurs at >5 to 6 ERL exceedances. However, Type I error (false positives) was always higher (>20 to >40%) compared to Type II error resulting in lower percentage correct classification with ERLs compared to ERMs (Figure 21a vs 22a).

Selecting a criterion of 60% did not substantially improve classification by ERLs in the CR14 or HA14 tests, but correct classification increased about 10 to 30% in the HA28 test (Figure 22a vs 22b). Using a 70% criterion for selection of ERLs, 70 to 90% of the samples were correctly classified with 8 to 10 exceedances in the CR14 and HA14 tests and with 1 to 2 exceedances in the HA28 test (Figure 22a vs 22c). However, in the HA28 test only non-toxic samples are correctly classified at 3 or more ERL exceedances because of the high Type II error (toxic/no hit) resulting from using just 2 ERLs (Figure 22c). In summary, correct classification of samples can be improved by using multiple ERLs with a high percentage of correct classification. However, samples which exceeded multiple ERLs were typically samples which also exceeded ERMs. Hence, exceeding a few ERMs or multiple ERLs resulted in similar correct classification of samples.

For NECs, about 70 to 90% of samples are correctly classified at 1 to 10 exceedances regardless if all the NECs (Figure 23a), the 60% criterion (Figure 23b), or the 70% criterion (Figure 23c) are used. Type I and Type II errors are generally equal at about 1 to 3 exceedances. However, Type

II error (false negatives) often starts at 5 to 10% with only 1 exceedance. Increasing the minimum number of exceedances decreased correct classification of samples. This drop in correct classification results from increased Type II error if multiple exceedances of NECs are required to classify a sample as toxic.

Figure 24 directly compares correct classification, Type I error, and Type II error as a function of the minimum number of ERL, ERM, or NEC exceedances for the HA28 test. ERLs only classify about 40 to 60% of the samples correctly. The higher Type I error associated with ERLs compared to either ERMs or NECs results in this lower correct classification by ERLs. ERMs and NECs correctly classify a similar percentage of samples; however, Type II error is consistently higher with NECs compared to either ERMs or ERLs. In summary, these analyses indicate the reliability of correct classifications is similar between ERMs and NECs; however, ERMs minimize Type I error relative to ERLs and minimize Type II error relative to NECs. The high Type I error typically associated with ERLs is the primary reason Long et al. (1995) and MacDonald et al. (1995) recommend ERMs and PELs, but not ERLs or TELs should be used to predict toxicity of samples. However, ERLs and TELs can be used to efficiently identify concentrations below which toxicity is rarely observed.

Reliability of ERMs for PAHs and total PCBs calculated using dry-weight concentrations (Appendix 3a) and calculated using sediment concentrations normalized to TOC concentrations (Appendix 3c) are plotted in Figure 25. None of the individual ERMs calculated using sediment concentrations normalized to TOC correctly classified $\geq 70\%$ of the samples. Therefore, Figure 25 plots correct classification of samples as a function of ERM exceedances using only individual ERMs which correctly classify $\geq 60\%$ of the samples in the HA28 test ($n = 11$ SECs). Correct classification of samples ranged between 60 to 70% and Type I and Type II errors were similar based on exceedances of ERMs using either dry-weight concentrations or sediment concentrations normalized to TOC concentrations. Correct classifications were also similar using PELs and NECs calculated using dry-weight concentrations or calculated using sediment concentrations normalized to TOC concentrations.

One would expect SECs calculated using sediment concentrations normalized to TOC concentrations to be more reliable than SECs calculated using dry-weight concentrations since TOC reportedly controls the bioavailability of non-ionic organic contaminants such as PAHs and PCBs in sediment (Di Toro et al., 1991). The range of TOC concentrations in our database was relatively narrow compared to the ranges of contaminant concentrations. The mean concentration of TOC was 2.7% with a 95% confidence interval of only $\pm 0.65\%$ ($n=62$). In contrast, the concentration ranges of contaminants calculated using dry-weight concentrations typically varied by several orders of magnitude. Therefore, normalizing dry-weight concentrations to a relatively narrow range of TOC concentrations had little influence on relative concentrations of contaminants among samples. Similar findings were reported by Barrick et al. (1988) for AETs and Long et al. (1995) for ERMs calculated using sediment concentrations normalized to TOC concentrations. However, it is surprising that there was not at least a trend of

increased reliability with SECs calculated using sediment concentrations normalized to TOC concentrations. The lower reliability of SECs calculated using sediment concentrations normalized to TOC concentrations may indicate PAHs and PCBs were not causing the toxicity, but were only associated with the toxic chemicals. Use of sediment toxicity identification evaluations (TIE) or studies using spiking of sediment are needed to establish these cause and effect relationships (Ankley and Thomas, 1992; Lamberson and Swartz, 1992; Ankley et al., 1996).

Predictive Ability of SECs

The predictive ability of SECs (ability to estimate toxicity in an independent database) was evaluated by first calculating SECs using just the Great Lakes (GL) portion of the database ($n = 27$ samples). We were able to calculate GL SECs primarily for total metals, simultaneously extracted metals (SEM metals), and PAHs (Appendix 3b). These GL SECs were then used to predict responses in independent HA28 and CR14 tests with Clark Fork River (CFR) sediments ($n = 15$ samples). The CFR sediments contained elevated concentrations of As, Cd, Cu, Pb, and Zn. Concentrations of PAHs, PCBs, and chlorinated pesticides were not elevated in these samples (Kemble et al., 1994). In the CFR tests, 7% of the sediments were toxic in the CR14 test and 53% of the samples were toxic in the HA28 test (Table 1).

Figure 26 plots correct classification of CFR samples as a function of the number of exceedances of individual GL ERMs which correctly classified $\geq 70\%$ of the GL samples. For the CR14 test, about 80 to 90% of the CFR samples were correctly classified at 1 to 2 exceedances of GL ERMs. The majority of the samples were not toxic and did not exceed GL ERMs for the CR14 test. Type II error (toxic/no hit) was always $<10\%$ and Type I error (not toxic hit) was 20% at 1 exceedance dropping to $<10\%$ with >2 GL ERM exceedances. For the HA28 test, about 70% of the CFR samples were correctly classified, Type II error was $<10\%$, and Type I error was 20 to 30% at 1 to 2 GL ERM exceedances. Above 2 GL ERM exceedances in the HA28 test, Type II error increases more than the decrease in Type I error, resulting in a substantial drop in correct classification of samples. Evaluations using GL PELs and GL NECs resulted in similar predictive ability compared to GL ERMs for the CR14 and HA28 tests with CFR sediments.

The CFR sediments primarily contained high concentrations of Cu and Zn resulting in exceedances of GL ERMs for these two metals. Requiring more than 2 exceedances of GL ERMs resulted in a high Type II error (toxic samples misclassified as not toxic). Hence, classification based on multiple exceedances of SECs in a preliminary screening of sediments which contain a limited number of contaminants may result in high Type II error. For example, Type II error was $<10\%$ and Type I error was 10 to 30% at 1 to 2 GL ERM exceedances in both the CR14 and HA28 tests with CFR sediments, but Type II error was high with multiple exceedances in the HA28 test (Figure 26). Therefore, a low number of SEC exceedances should be used to conduct a preliminary screening to predict the potential for toxicity in the absence of actual toxicity testing. This would minimize the potential for false negatives (i.e., Type II error) at the risk of accepting higher false positives (i.e., Type I error).

We have included this one example of how the predictive ability of SECs can be evaluated using an independent data set. We are currently in the process of using our SECs calculated from the entire database to predict the response of *Hyalella azteca* and *Chironomus riparius* in a variety of independent data sets generated by other laboratories (Appendix 5: Field and Cairncross, 1994; McGee et al., 1994; Schlekat et al., 1994; Day et al., 1995; Hoke et al., 1995; M.D. Sprenger,

USEPA, Edison, NJ, unpublished data). Data sets described by Pastorok et al. (1994) and Batts and Cubbage (1995) are also being evaluated.

Comparability to Published SECs

Example comparisons are plotted of our SECs relative to other published SECs for benzo[a]pyrene (BaP; Figure 27 and Appendix 6) and copper (Figure 28 and Appendix 6). Our SECs are typically lower than the AET (Figure 27 and 28) and EQP values (Figure 27) and are relatively similar to paired marine ERMs, ERLs, PELs, or TELs and freshwater PELs or TELs (Figure 27 and 28; Smith et al., 1996). The SECs based on EQP and AET approaches are typically near the maximum concentration for the particular chemical in our database. This is not surprising since EQP values represent concentrations of single chemicals predicted to be toxic whereas the other SECs listed in Figure 27 and 28 represent concentrations of a chemical associated with toxicity in mixtures of chemicals in field-collected sediments (Hoke et al., 1995).

Smith et al. (1996) reported 14 of their 23 TELs and 15 of their 23 PELs were within a factor of 3 for at least two other published SECs. These results indicate SECs developed using a variety of approaches and data sets are often comparable. The SECs calculated by Smith et al. (1996) were also comparable to our SECs listed in Appendix 3 for HA28 tests. However, reliability of the SECs in Smith et al. (1996) was generally lower than the reliability of our SECs. The database used by Smith et al. (1996) to calculate SECs included our data and a variety of additional data sources from North America. This lower reliability of SECs reported by Smith et al. (1996) resulted from including data for additional species from studies reporting no effects without matching effect data (i.e., intolerant species or short exposure duration) or by including data from benthic community surveys (i.e., difficult to compare sediment chemistry to distributions of benthos). Additional comparisons are ongoing to further evaluate comparability and predictive ability of published SECs to our SECs using additional independent data sets (Appendix 5; Pastorok et al., 1994; Batts and Cubbage, 1995).

Ultimately, the best measure of comparability among SECs is not to compare similarity in absolute concentrations, but to compare how different types of SECs correctly (or incorrectly) predict toxicity in independent samples. For example, Figure 29 plots predictions of toxicity in our HA28 tests as a function of exceedances of freshwater PELs (PELF; Smith et al., 1996); *Hyalella azteca* AETs (AET5; Batts and Cubbage, 1995; assuming 2% TOC); EQP (USEPA, 1988; Hoke et al., 1995; assuming 2% TOC); and SLCs (SLC1; lowest effect level for Screening Level Concentrations; Persaud et al., 1992). At 1 to 6 exceedances of these published PELs, AETs, and EQP values, toxicity is correctly predicted in about 60 to 80% of the samples whereas SLCs only correctly predict toxicity in about 40 to 60% of the samples. The higher Type I error (false positives) associated with SLCs compared to the other values results in this lower correct prediction by SLCs. The PEL, AET, and EQP values correctly predict toxicity in a similar percentage of samples; however, Type II error (false negatives) is consistently higher with AET and EQP values compared to either PELs or SLCs. In summary, these analyses indicate predictive ability is similar between published PEL, AET, and EQP values; however, these PELs

minimize Type I error relative to SLCs and minimize Type II error relative to AET and EQP values. In addition, the predictive ability of these published SECs is comparable to the reliability of our SECs listed in Appendix 3.

Confirming Causality and Development of Sediment Management Decisions with SECs

Exceeding an SEC for a particular chemical in a field-collect sample does not necessarily mean the chemical caused the observed effect. Rather, the SEC is the concentration of a chemical that is associated with the effect. Sediment samples typically contain complex mixtures of contaminants. Additional information is needed to identify the specific contaminants that were actually responsible for the toxicity. Confirmation of the cause of sediment toxicity can be accomplished using sediment spiking or toxicity identification evaluation (TIE) procedures. Once the probable cause(s) of sediment toxicity has been identified, better decisions can be made regarding potential remediation options.

Spiking evaluations could be conducted by adding contaminants to a non-toxic sediment (e.g., BR-01) or control sediment (USEPA, 1994; ASTM, 1995). This information could be used to establish dose-response and cause-effect relationships between individual chemicals and adverse responses. Select metals or organic contaminants could be evaluated individually and in combination to determine toxic concentrations in sediment. Sediments spiked with concentrations bracketing various SECs could be used to generate LC50s or a minimum concentration at which effects are observed (e.g., low-observable-effect concentration, LOEC). The LC50s and LOECs could then be used to determine if the toxicity associated with exceeding an SEC was caused by contaminants in sediment (Swartz and Di Toro, 1997).

Equilibration and mixing conditions vary widely in sediment spiking studies (ASTM, 1995). The duration of contact between the chemical and sediment can affect partitioning and bioavailability of contaminants. Therefore, spiked sediments should be aged long enough to establish a steady state between contaminants and the various sediment phases. USEPA (1994) recommends holding spiked samples for at least one month before testing. Furthermore, a range in sediment TOC, DOC, and AVS could also be evaluated depending on the chemicals(s) under consideration. Data from sediment spiking tests should be compared to field data on chemical concentrations in natural sediments and observed effects. This information could be used to better determine cause-effect relationships between contamination and toxicity. Approaches such as TIE could also be used to evaluate the cause of acute toxicity of sediment pore-water samples (Ankley and Thomas, 1992; Ankley et al., 1996). For example, sodium thiosulfate or EDTA could be used to chelate toxic metals and pH adjustments could be used to evaluate ammonia toxicity.

SECs generated with laboratory toxicity data should be confirmed relative to the responses observed in benthic community assessments. Canfield et al. (1994, 1996a,b) used to sediment quality triad (Triad) to evaluate benthic communities in the Great Lakes, in the Clark Fork River, Montana and the upper Mississippi River. The Triad approach integrates data from: (1)

laboratory exposures (e.g., sediment toxicity), (2) benthic community structure (e.g., number of genera), and (3) chemical and physical analyses (e.g., metals, grain size) to provide strong, complementary evidence for the degree of pollution-induced degradation in aquatic communities.

Good concordance was evident between laboratory toxicity, sediment chemistry, and benthic invertebrate community structure in extremely contaminated samples in our database (Canfield et al. 1994, 1996a,b). However, less concordance was observed between benthos and either laboratory toxicity or chemistry in the moderately contaminated samples. Laboratory toxicity tests were better at discriminating chemical concentrations in sediments than the many commonly used measures of benthic invertebrate community structure likely because benthic organisms may be responding to factors such as habitat alteration as well as contaminants. We are in the process of calculating SECs for a variety of benthic indices and plan to evaluate the reliability, comparability, and predictive ability of these SECs for benthos compared to SECs for laboratory toxicity tests.

Throughout this report we have evaluated the reliability using the frequency of exceeding individual SECs. Canfield et al. (1996a,b) and Kemble et al. (1996) evaluated the reliability of our ERMs using a toxic quotient approach. A toxic quotient was calculated for each sample by first dividing the concentration of individual chemicals by their respective ERM and then summing each of these individual values. Figure 30 plots the relationship between the frequency of ERM exceedances and the sum of the ERM toxic quotient for HA28 samples using all ERMs regardless of the percent correct classification. The frequency of observed toxicity in samples increases at either a sum ERM toxic quotient of about 10 to 20 or at a frequency of ERM exceedances of about 3 to 7. A similar relationship is evident if only individual ERMs are used that correctly classify $\geq 60\%$ or $\geq 70\%$ of the samples; however, a lower number of ERM exceedances or lower sum ERM toxic quotients are needed to consistently estimate observed toxicity. In summary, either the sum toxic quotient approach or the frequency of SEC exceedances are equally reliable at classifying samples as either toxic or not toxic in our database ((Canfield et al., 1996a,b; Kemble et al., 1996).

Conclusions and Recommendations

ERMs and ERLs are generally as reliable as paired PELs and TELs at classifying samples as either toxic and not toxic in our database. Reliability of the SECs in terms of correctly classifying sediment samples is similar between ERMs and NECs; however, ERMs minimize Type I error (false positives) relative to ERLs and minimize Type II error (false negatives) relative to NECs. ERMs and NECs rather than ERLs should be used to predict toxicity of samples due to the lower Type I error associated with them. However, ERLs can be used to efficiently identify concentrations below which toxicity is rarely observed. Correct classification of samples can be improved by using only the most reliable individual ERMs or NECs for chemicals (i.e., those with a higher percentage of correct classification). When SECs are used to conduct a preliminary screening to predict the potential for toxicity in the absence of actual toxicity testing, a low number of SEC exceedances should be used to minimize the potential for false negatives (i.e., Type II error); however, the risk of accepting higher false positives (i.e., Type I error) is increased.

Calculating SECs using dry-weight concentrations or using sediment concentrations normalized to TOC concentrations for PAHs and total PCBs resulted in similar correct classification of toxicity and similar Type I and Type II errors. The range of TOC concentrations in our database was relatively narrow compared to the ranges of contaminant concentrations. Therefore, normalizing dry-weight concentrations to a relatively narrow range of TOC concentrations had little influence on relative concentrations of contaminants among samples.

SECs generated using data from field-collected samples should not be used independently to establish trigger levels for clean up of sediments. The strength of SECs developed using data from tests with field-collected sediments is in their use in predicting the potential for toxicity in independent field-collected sediment samples. A primary use of SECs developed with field-collected sediments should be to provide guidance for determining sites which may require further investigation. The ability of any SEC or sediment toxicity test to predict benthic community effects should be considered before either of these approaches are used to routinely evaluate sediment quality.

Our SECs were calculated from toxicity tests with field-collected samples. If a chemical concentration exceeds an SEC generated using data from these tests with field-collected samples, it does not necessarily mean the chemical caused the observed effect. Rather, the SEC is the concentration of a chemical that is associated with the effect. Field-collected sediments typically contain complex mixtures of contaminants. Additional information is needed to identify the specific contaminants that were actually responsible for the toxicity. Confirmation of sediment toxicity due to individual or groups of contaminants or the interactive effects of sediment toxicants can be evaluated by using TIE procedures or by conducting toxicity tests with chemicals spiked into sediments. Once the probable cause(s) of sediment toxicity has been identified, better decisions can be made regarding remediation options.

Ideally, multiple approaches should be used to develop SECs and evaluate sediment quality. An integration of methods using a weight of evidence is the most desirable approach for assessing or confirming effects of contaminants associated with sediment. Sediment evaluations integrating data from laboratory exposures, chemical analyses, and benthic community assessments (the Sediment Quality Triad) provide strong complementary evidence of the degree of pollution-induced degradation in aquatic communities.

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Table 1. Percentage of whole-sediment samples identified as toxic in *Chironomus riparius* 14-d (CR14), *Hyalella azteca* 14-d (HA14), or *H. azteca* 28-d (HA28) tests.

	<u>TOXIC</u> ¹	<u>TOXIC-S</u> ²	<u>TOXIC-G</u> ³	<u>TOXIC-M</u> ⁴
<u>All samples</u>				
CR14	26 (42)	24 (42)	9 (34)	ND
HA14	41 (32)	25 (32)	20 (25)	24 (21)
HA28	39 (62)	26 (62)	34 (44)	11 (36)
<u>Great Lakes</u>				
CR14	37 (27)	33 (27)	11 (19)	ND
HA14	48 (27)	30 (27)	20 (25)	24 (21)
HA28	48 (27)	41 (27)	24 (25)	5 (21)
<u>Upper Mississippi River</u>				
HA28	0 (5)	0 (5)	ND	ND
<u>Clark Fork River</u>				
CR14	7 (15)	7 (15)	7 (15)	ND
HA28	53 (15)	13 (15)	53 (15)	20 (15)
<u>Trinity River</u>				
HA14	0 (5)	0 (5)	ND	ND
HA28	0 (5)	0 (5)	ND	ND
<u>Mobile Bay</u>				
HA28	0 (5)	0 (5)	ND	ND
<u>Galveston Bay</u>				
HA28	60 (5)	60 (4)	25 (4)	ND

¹TOXIC: Significant reduction in survival, growth, or maturation relative to the control ($p<0.05$, N in parentheses)

²TOXIC-S: Significant reduction in survival

³TOXIC-G: Significant reduction in growth

⁴TOXIC-M: Significant reduction in maturation (*H. azteca* only)

⁵ND: Not determined

Table 2. Percentage of paired tests or paired endpoints identifying samples as toxic in *Chironomus riparius* 14-d (CR14), *Hyalella azteca* 14-d (HA14), or *H. azteca* 28-d (HA28) tests. A designation of "-S" represents survival, "-G" represents growth, and a row without an "-S" or a "-G" represents survival or growth endpoints for those tests.

	<u>TOX/TOX</u> ¹	<u>NOT/NOT</u> ²	<u>TOX/NOT</u> ³	<u>NOT/TOX</u> ⁴	<u>N</u> ⁵
CR14/HA28	24	48	2	26	42
CR14-S/HA28-S	19	64	5	12	42
CR14-G/HA28-G	9	62	0	29	34
HA14/HA28	34	53	6	6	32
HA14-S/HA28-S	25	66	0	10	32
HA14-G/HA28-G	8	64	12	16	25
HA14/CR14	37	52	11	0	27
HA14-S/CR14-S	26	63	4	7	27
HA14-G/CR14-G	5	68	21	5	19
CR14-S/CR14-G	6	85	6	3	34
HA14-S/HA14-G	4	60	20	16	25
HA28-S/HA28-G	16	52	14	18	44

¹TOX/TOX: Samples toxic (significant reduction relative to the control $p<0.05$) with both endpoints or tests

²NOT/NOT: Samples not toxic with both endpoints or tests

³TOX/NOT: Samples toxic to the first but not the second endpoint or test

⁴NOT/TOX: Samples not toxic to the first but toxic to the second endpoint or test

⁵N: Number of samples

FIGURES

For Figures 1 through 20:

1. Comparability was evaluated by plotting the ratio of concentrations of paired SECs (for example in Figure 1a: plots the ratio of paired ERM-Gs to ERMs; an asterisk indicates one or more ratios greater 2.4).
2. Reliability was evaluated by plotting the ability of paired SECs to: (1) correctly classify sediment samples (e.g., ERM-Gs to ERMs; Figure 1b), (2) incorrectly classify non-toxic samples as toxic (Type I error; e.g., Figure 1c), and (3) incorrectly classify toxic samples as not toxic (Type II error; e.g., Figure 1d).
3. The solid lines (e.g., Figure 1b to 1d for ERM vs ERM-G) are lines of unity and the dashed lines are $\pm 20\%$ of unity. In Figure 1b to d: (1) ERM=ERM-G if the paired comparison is within $\pm 20\%$ of unity; (2) ERM>ERM-G if the paired comparison is >20% of unity; and (3) ERM<ERM-G if the paired comparison is <20% of unity.
4. 5= total PCBs, 4 = PAHs, 3 = metals, 1 = physical characteristics (see Appendix 2c).

Appendix 1 Summary of biological, chemical, and physical characterization performed on sediment samples from each site.

APPENDIX 1: BIOLOGICAL, PHYSICAL AND CHEMICAL CHARACTERIZATIONS PERFORMED

CHAR	NAME	TYPE	INDIANA HARBOR	BUFFALO RIVER	SAGINAW RIVER-1	SAGINAW RIVER-3	WAUKEGAN HABOR	UPPER MISS	MILLTOWN	CLARK FORK	TRINITY RIVER	MOBILE BAY	GALVESTON BAY
BIOLOGICAL													
CR14	OVERALL TOXICITY	NOT	1	3	3	8	2	.	7	7	.	.	.
CR14	OVERALL TOXICITY	TOX	4	3	1	.	2	.	1	.	.	.	.
CR14	SURVIVAL	NOT	1	4	3	8	2	.	7	7	.	.	.
CR14	SURVIVAL	TOX	4	2	1	.	2	.	1	.	.	.	.
CR14	GROWTH	NOT	1	5	3	8	.	.	7	7	.	.	.
CR14	GROWTH	TOX	.	1	1	.	.	.	1	.	.	.	.
HA14	OVERALL TOXICITY	NOT	1	1	3	7	2	.	.	.	5	.	.
HA14	OVERALL TOXICITY	TOX	4	5	1	1	2	.	.	.	.	.	.
HA14	SURVIVAL	NOT	1	5	3	8	2	.	.	.	5	.	.
HA14	SURVIVAL	TOX	4	1	1	.	2	.	.	.	.	.	.
HA14	GROWTH	NOT	3	1	4	8	4	.	.	.	.	.	.
HA14	GROWTH	TOX	.	5	.	.	.	.	.	.	.	.	.
HA14	MATURATION	NOT	3	2	4	7	.	.	.	.	.	.	.
HA14	MATURATION	TOX	.	4	.	1	.	.	.	.	.	.	.
HA28	OVERALL TOXICITY	NOT	1	2	1	8	2	5	2	5	5	5	2
HA28	OVERALL TOXICITY	TOX	4	4	3	.	2	5	6	2	5	3	2
HA28	SURVIVAL	NOT	1	2	3	8	2	5	7	6	5	5	2
HA28	SURVIVAL	TOX	4	4	1	.	2	.	1	1	.	3	.
HA28	GROWTH	NOT	3	4	1	8	3	.	2	5	.	3	.
HA28	GROWTH	TOX	.	2	3	.	1	.	6	2	.	.	1
HA28	MATURATION	NOT	3	6	3	8	.	.	6	6	.	.	.
HA28	MATURATION	TOX	.	.	1	.	.	.	2	1	.	.	.
PHYSICAL & CHEMICAL													
101	Total Organic Carbon	BT	5	6	4	8	4	5	8	7	5	5	5
102	Acid Volatile Sulfides	BT	5	6	4	7	.	.	8	7	.	.	5
104	Clay	BT	1	1	1	1	4	5	8	7	5	.	5
105	Sand	BT	5	6	4	8	4	5	8	7	5	.	5
106	Water	BT	5	6	4	8	4	5	8	7	5	.	5
107	Silt	BT	1	1	1	1	4	5	8	7	5	.	5
108	Ash-Free Dry Weight	BT	.	.	.	.	.	.	8	7	.	.	.
109	Cation Exchange Capacity	BT	.	.	.	.	.	.	8	7	.	.	.
110	Porewater ammonia	BT	3	6	4	8	.	.	8	7	.	.	5
111	Porewater hydrogen sulfide	BT	2	.	.	.	.	.	8	7	.	.	.
201	2,3,7,8-Tetrachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
202	Total Tetrachlorodibenzofuran	BT	3	3	3	7	.	.	.	.	.	.	.
203	2,3,7,8-Tetrachlorodibenzodioxin	BT	3	5	3	7	.	.	.	.	.	.	.
204	Total Tetrachlorodibenzodioxin	BT	3	1	3	7	.	.	.	.	.	.	.
205	1,2,3,7,8-Pentachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
206	2,3,4,7,8-Pentachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
207	Total Pentachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
208	1,2,3,7,8-Pentachlorodibenzodioxin	BT	3	5	3	4	.	.	.	.	.	.	.
209	Total Pentachlorodibenzodioxin	BT	2	1	3	6	.	.	.	.	.	.	.
210	1,2,3,4,7,8-Hexachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
211	1,2,3,6,7,8-Hexachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
212	1,2,3,7,8,9-Hexachlorodibenzofuran	BT	.	5	3	7	.	.	.	.	.	.	.
213	2,3,4,6,7,8-Hexachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.

APPENDIX 1: BIOLOGICAL, PHYSICAL AND CHEMICAL CHARACTERIZATIONS PERFORMED

2

CHAR	NAME	TYPE	INDIANA HARBOR	BUFFALO RIVER	SAGINAW RIVER-1	SAGINAW RIVER-3	WAUKEGAN HABOR	UPPER MISS	MILLTOWN	CLARK FORK	TRINITY RIVER	MOBILE BAY	GALVESTON BAY
214	Total Hexachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
215	1,2,3,4,7,8-Hexachlorodibenzodioxin	BT	3	5	3	5	.	.	.	.	.	.	.
216	1,2,3,6,7,8-Hexachlorodibenzodioxin	BT	3	5	3	5	.	.	.	.	.	.	.
217	1,2,3,7,8,9-Hexachlorodibenzodioxin	BT	3	5	3	7	.	.	.	.	.	.	.
218	Total Hexachlorodibenzodioxin	BT	3	3	3	7	.	.	.	.	.	.	.
219	1,2,3,4,6,7,8-Heptachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
220	1,2,3,4,7,8,9-Heptachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
221	Total Heptachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
222	1,2,3,4,6,7,8-Heptachlorodibenzodioxin	BT	3	5	3	7	.	.	.	.	.	.	.
223	Total Heptachlorodibenzodioxin	BT	3	5	3	7	.	.	.	.	.	.	.
224	Octachlorodibenzofuran	BT	3	5	3	7	.	.	.	.	.	.	.
225	Octachlorodibenzodioxin	BT	3	5	3	7	.	.	.	.	.	.	.
300	Aluminum	BS	1	1	1	1	.	.	8	7	1	.	.
300	Aluminum	BT	1	1	1	1	.	.	8	7	1	.	5
301	Silver	BT	4	5	3	7	.	.	.	.	.	.	.
301	Silver	PW	4	5	3	4	.	.	.	.	.	.	.
302	Arsenic	BS	1	1	1	1	.	.	8	7	1	.	.
302	Arsenic	BT	5	6	4	8	4	.	8	7	5	.	5
302	Arsenic	PW	5	6	4	5	.	.	8	7	1	.	.
303	Cadmium	BS	5	6	4	7	.	.	8	7	1	.	.
303	Cadmium	BT	5	6	4	8	4	5	8	7	5	5	5
303	Cadmium	PW	5	6	4	5	.	.	8	7	1	.	.
304	Chromium	BS	5	6	4	7	.	.	8	7	1	.	.
304	Chromium	BT	5	6	4	8	4	5	8	7	5	5	5
304	Chromium	PW	5	6	4	5	.	.	8	7	1	.	.
305	Copper	BS	5	6	4	7	.	.	8	7	1	.	.
305	Copper	BT	5	6	4	8	4	.	8	7	5	.	5
305	Copper	PW	5	6	4	5	.	.	8	7	1	.	.
306	Iron	BS	5	6	4	1	.	.	8	7	1	.	.
306	Iron	BT	5	6	4	1	.	.	8	7	1	.	5
307	Mercury	BT	4	5	3	7	.	.	.	.	.	.	.
307	Mercury	PW	4	5	3	4	.	.	.	.	.	.	.
308	Manganese	BS	5	6	4	7	.	.	8	7	1	.	.
308	Manganese	BT	5	6	4	8	.	.	8	7	1	.	5
309	Nickel	BS	5	6	4	7	.	.	8	7	1	.	.
309	Nickel	BT	5	6	4	8	4	5	8	7	5	5	5
309	Nickel	PW	5	6	4	5	.	.	8	7	1	.	.
310	Lead	BS	5	6	4	7	.	.	8	7	1	.	.
310	Lead	BT	5	6	4	8	4	5	8	7	5	5	5
310	Lead	PW	5	6	4	5	.	.	8	7	1	.	.
311	Selenium	BT	4	5	3	7	.	.	.	.	.	.	.
312	Zinc	BS	5	6	4	7	.	.	8	7	1	.	.
312	Zinc	BT	5	6	4	8	4	5	8	7	5	5	5
312	Zinc	PW	5	6	4	5	.	.	8	7	1	.	.
313	Methyl-mercury	BT	4	5	3	4	.	.	.	.	.	.	.
314	Tributyltin	BT	4	5	3	4	.	.	.	.	.	.	.
315	Dibutyltin	BT	4	5	3	4	.	.	.	.	.	.	.
316	Monobutyltin	BT	4	5	3	4	.	.	.	.	.	.	.
399	Ratio of SEM metals to AVS	BS	4	5	3	6	.	.	7	6	.	.	5

APPENDIX 1: BIOLOGICAL, PHYSICAL AND CHEMICAL CHARACTERIZATIONS PERFORMED

CHAR	NAME	TYPE	INDIANA HARBOR	BUFFALO RIVER	SAGINAW RIVER-1	SAGINAW RIVER-3	WAUKEGAN HABOR	UPPER MISS	MISS. MILLTOWN	CLARK FORK	TRINITY RIVER	MOBILE BAY	GALVESTON BAY
401	1,4-Dichlorobenzene	BT	4	5	3	7	.	.	.	.	.	.	.
402	1,2-Dichlorobenzene	BT	.	.	.	7	.	.	.	.	.	.	.
403	1,3-Dichlorobenzene	BT	.	.	.	7	.	.	.	.	.	.	.
404	Naphthalene	BT	5	6	4	8	4	5	8	7	5	5	5
405	2-Methylnaphthalene	BT	4	5	3	7	.	.	.	.	.	.	.
406	Acenaphthene	BT	1	1	1	1	4	5	8	7	5	5	.
407	Dibenzofuran	BT	4	5	3	7	.	.	.	.	.	.	.
408	Fluorene	BT	5	6	4	8	4	5	8	7	5	5	5
409	Phenanthrene	BT	5	6	4	8	4	5	8	7	5	5	5
410	Anthracene	BT	5	6	4	8	4	5	8	7	5	5	5
411	Fluoranthene	BT	5	6	4	8	4	5	8	7	5	5	5
412	Pyrene	BT	5	6	4	8	4	5	8	7	5	5	5
413	Benz(a)anthracene	BT	5	6	4	8	4	5	8	7	5	5	5
414	Chrysene	BT	5	6	4	8	4	5	8	7	5	5	5
415	Benzo(b)fluoranthene	BT	4	5	3	7	.	.	.	.	.	.	.
416	Benzo(k)fluoranthene	BT	4	5	3	7	.	.	.	.	.	.	.
417	Benzo(a)pyrene	BT	5	6	4	8	4	5	8	7	5	5	5
418	Indeno (1,2,3-c,d)pyrene	BT	5	6	4	8	4	5	8	7	5	5	.
419	Benzo(g,h,i)perylene	BT	5	6	4	8	4	5	8	7	5	5	5
420	Benzo(b,k)fluoranthene	BT	1	1	1	1	4	5	8	7	5	5	5
421	Acenaphthylene	BT	1	1	1	1	4	5	8	7	5	5	5
422	Dibenzo(a,h)anthracene	BT	1	1	1	1	4	5	8	7	5	5	5
423	4-Methylanphthalene	BT	.	.	.	7	.	.	.	.	.	.	.
450	PAH-T	BT	5	6	4	8	4	5	8	7	5	5	5
451	PAH-L	BT	5	6	4	8	4	5	8	7	5	5	5
452	PAH-H	BT	5	6	4	8	4	5	8	7	5	5	5
501	PCB 1016	BT	4	5	3	.	.	.	.	.	.	.	.
502	PCB 1221	BT	4	5	3	.	.	.	.	.	.	.	.
503	PCB 1232	BT	4	5	3	.	.	.	.	.	.	.	.
504	PCB 1242	BT	4	5	3	7	.	.	.	.	.	.	.
505	PCB 1248	BT	4	5	3	.	.	.	.	.	.	.	.
506	PCB 1254	BT	4	5	3	7	.	.	.	.	.	.	.
507	PCB 1260	BT	4	5	3	7	.	.	.	.	.	.	.
508	TOTAL PCBS	BT	1	1	1	1	4	5	8	7	1	.	.
601	Dimethyl Phthalate	BT	4	5	3	7	.	.	.	.	.	.	.
602	Dibutyl Phthalate	BT	.	.	.	7	.	.	.	.	.	.	.
603	Diethyl Hexylphthalate	BT	4	5	3	.	.	.	.	.	.	.	.
604	2 Fluorobiphenyl	BT	4	5	3	7	.	.	.	.	.	.	.
605	Nitrobenzene	BT	4	5	3	7	.	.	.	.	.	.	.
606	Butyl Benzyl Phthalate	BT	4	5	3	7	.	.	.	.	.	.	.
607	Di-n-octylphthalate	BT	4	5	3	7	.	.	.	.	.	.	.
608	Bis(2-ethylhexyl)Phthalate	BT	.	.	.	7	.	.	.	.	.	.	.
701	Aldrin	BT	4	5	3	7	.	.	.	.	.	.	.
702	Hexachlorocyclohexane-alpha	BT	4	5	3	7	.	.	.	.	.	.	.
703	Hexachlorocyclohexane-beta	BT	4	5	3	7	.	.	.	.	.	.	.
704	Hexachlorocyclohexane-delta	BT	4	5	3	7	.	.	.	.	.	.	.
705	Hexachlorocyclohexane-gamma	BT	4	5	3	7	.	.	.	.	.	.	.
706	trans-chlordane	BT	4	5	3	7	.	.	.	.	.	.	.
707	cis-chlordane	BT	4	5	3	7	.	.	.	.	.	.	.

APPENDIX 1: BIOLOGICAL, PHYSICAL AND CHEMICAL CHARACTERIZATIONS PERFORMED

3

CHAR	NAME	TYPE	INDIANA HARBOR	BUFFALO RIVER	SAGINAW RIVER-1	SAGINAW RIVER-3	WAUKEGAN HABOR	UPPER MISS	MILLTOWN	CLARK FORK	TRINITY RIVER	MOBILE BAY	GALVESTON BAY
708	4,4,DDD	BT	4	5	3	7	.	.	.	.	.	.	.
709	4,4,DDE	BT	4	5	3	7	.	.	.	.	.	.	.
710	4,4,DDT	BT	4	5	3	7	.	.	.	.	.	.	.
711	Dieldrin	BT	4	5	3	7	.	.	.	.	.	.	.
712	Endosulfan-alpha	BT	4	5	3	7	.	.	.	.	.	.	.
713	Endosulfan-beta	BT	4	5	3	7	.	.	.	.	.	.	.
714	Endosulfan sulphate	BT	4	5	3	7	.	.	.	.	.	.	.
715	Endrin	BT	4	5	3	7	.	.	.	.	.	.	.
716	Endrin Aldehyde	BT	4	5	3	7	.	.	.	.	.	.	.
717	Endrin Ketone	BT	4	5	3	7	.	.	.	.	.	.	.
718	Heptachlor	BT	4	5	3	7	.	.	.	.	.	.	.
719	Heptachlor epoxide	BT	4	5	3	7	.	.	.	.	.	.	.
720	Toxaphene	BT	4	5	3	7	.	.	.	.	.	.	.
721	Methoxychlor	BT	4	5	3	7	.	.	.	.	.	.	.

- Appendix 2a Biology database. The computer disk that accompanies the report contains the electronic version of this entire appendix (file name: "apdx2a.txt" for the ascii format and "apdx2a.dbf" for the database file).
- Appendix 2b Chemistry database. The computer disk that accompanies the report contains the electronic version of this entire appendix (file name: "apdx2b.txt" for the ascii format and "apdx2b.dbf" for the database file).

Appendix 2c

Chemistry codes. NUMCODE = Numeric code, MOLE. WT. = molecular weight, NFCRC REPORT = Designation in USEPA (1993), CHEM CODE = Designation for the current report, CHEMICAL NAME, NA = not applicable.

<u>NUMCODE</u>	<u>MOLE. WT.</u>	<u>NFCRC REPORT</u>	<u>CHEM CODE</u>	<u>CHEMICAL NAME</u>
101	NA	TOC	TOC	Total Organic Carbon
102	NA	AVS	AVS	Acid Volatile Sulfides
103	NA	SOLIDS	NA	Total Solids
104	NA	CLAY	CLAY	Clay
105	NA	SAND	SAND	Sand
106	NA	WATER	WATER	Water
107	NA	SILT	SILT	Silt
108	NA	AFDW	AFDW	Ash-Free Dry Weight
109	NA	CEC	CEC	Cation Exchange Capacity
110	NA	NH3-P	NH3P	Pore-water ammonia
111	NA	HS-P	HSP	Pore-water hydrogen sulfide
201	305.98	2378-TCDF	TCDF	2,3,7,8-Tetrachlorodibenzofuran
202	305.98	Total TCDF	TCDF-T	Total Tetrachlorodibenzofuran
203	321.98	2378 TCDD	TCDD	2,3,7,8-Tetrachlorodibenzodioxin
204	321.98	Total TCDD	TCDD-T	Total Tetrachlorodibenzodioxin
205	340.43	12378-PeCDF	PECDF-A	1,2,3,7,8-Pentachlorodibenzofuran
206	340.43	23478-PeCDF	PECDF-B	2,3,4,7,8-Pentachlorodibenzofuran
207	340.43	Total PeCDF	PECDF-T	Total Pentachlorodibenzofuran
208	356.43	12378-PeCDD	PECDD-A	1,2,3,7,8-Pentachlorodibenzodioxin
209	356.43	Total PeCDD	PECDD-T	Total Pentachlorodibenzodioxin
210	374.87	123478-HxCDF	HXCDF-A	1,2,3,4,7,8-Hexachlorodibenzofuran
211	374.87	123678-HxCDF	HXCDF-B	1,2,3,6,7,8-Hexachlorodibenzofuran
212	374.87	123789-HxCDF	HXCDF-C	1,2,3,7,8,9-Hexachlorodibenzofuran
213	374.87	234678-HxCDF	HXCDF-D	2,3,4,6,7,8-Hexachlorodibenzofuran
214	374.87	Total HxCDF	HXCDF-T	Total Hexachlorodibenzofuran
215	390.87	123478-HxCDD	HXCDD-A	1,2,3,4,7,8-Hexachlorodibenzodioxin
216	390.87	123678-HxCDD	HXCDD-B	1,2,3,6,7,8-Hexachlorodibenzodioxin
217	390.87	123789-HxCDD	HXCDD-C	1,2,3,7,8,9-Hexachlorodibenzodioxin
218	390.87	Total HxCDD	HXCDD-T	Total Hexachlorodibenzodioxin
219	409.32	1234678-HpCDF	HPCDF-A	1,2,3,4,6,7,8-Heptachlorodibenzofuran
220	409.32	1234789-HpCDF	HPCDF-B	1,2,3,4,7,8,9-Heptachlorodibenzofuran
221	409.32	Total HpCDF	HPCDF-T	Total Heptachlorodibenzofuran
222	425.32	1234678-HpCDD	HPCDD-A	1,2,3,4,6,7,8-Heptachlorodibenzodioxin
223	425.32	Total HpCDD	HPCDD-T	Total Heptachlorodibenzodioxin
224	443.76	OCDF	OCDF	Octachlorodibenzofuran
225	459.76	OCDD	OCDD	Octachlorodibenzodioxin
300	26.9815	Al	AL	
301	107.87	Ag	SILVER	Silver
302	74.92	As	ARSENIC	Arsenic
303	112.4	Cd	CADMIUM	Cadmium
304	51.996	Cr	CHROMIUM-T	Chromium
305	63.54	Cu	COPPER	Copper
306	55.847	Fe	IRON	Iron
307	200.59	Hg	MERCURY	Mercury
308	54.938	Mn	MANGANESE	Manganese
309	58.71	Ni	NICKEL	Nickel
310	207.19	Pb	LEAD	Lead
311	78.96	Se	SELENIUM	Selenium
312	65.37	Zn	ZINC	Zinc

Appendix 2c (continued)

313	215.63	Hg-Me	METHYL-HG	Methyl-mercury
314	290.04	TBT	TBT	Tributyltin
315	232.93	DBT	DBT	Dibutyltin
316	175.81	MBT	MBT	Monobutyltin
317	NA	NA	BERYILLIUM	NA
318	NA	NA	BORON	NA
319	NA	NA	MOLYBDENUM	NA
320	NA	NA	STRONTIUM	NA
399	NA	SEMAVS	SEMAVS	Ratio of SEM metals to AVS
401	147.01	1,4 DCB	14-2CLBNZ	1,4-Dichlorobenzene
402	147.01	1,2 DCB	12-2CLBNZ	1,2-Dichlorobenzene
403	147.01	1,3 DCB	13-2CLBNZ	1,3-Dichlorobenzene
404	128.16	Naph(1)	NAPHTHALENE	Naphthalene
405	142.2	2-MNaph	2-METHNAP	2-Methylnaphthalene
406	154.21	Acnaph(3)	ACENA	Acenaphthene
407	168	DBF	DIBNZFURAN	Dibenzofuran
408	166.21	Fluore(4)	FLUORENE	Fluorene
409	178.22	Phen(5)	PHENANTHNR	Phenanthrene
410	178.22	Anth(6)	ANTHRAcene	Anthracene
411	202.3	Fluora(7)	FLUORANTHNR	Fluoranthene
412	202.24	Pyrene(8)	PYRENE	Pyrene
413	228.28	BAA(9)	BAA	Benz(a)anthracene
414	228.28	Chrys(10)	CHRYSENE	Chrysene
415	252.30	BbFluor	BBF	Benzo(b)fluoranthene
416	252.30	BkFluor	BKF	Benzo(k)fluoranthene
417	252.30	BAP(13)	BAP	Benzo(a)pyrene
418	276	IndPyr(14)	ICDP	Indeno (1,2,3-c,d)pyrene
419	276	BghiPer(16)	BGHIP	Benzo(g,h,i)perylene
420	252.30	BbkFluor(11)	BBKF	Benzo(b,k)fluoranthene
421	152.2	Acenaphthylene(2)	ACENAPTYLE	Acenaphthylene
422	278	DBA(15)	DBA	Dibenz(a,h)anthracene
423	142.2	4-MNaph	4-METHNAP	4-Methylnaphthalene
424	NA	NA	PERYLENE	NA
450	NA	PAH-T	PAH-T	PAH Total (others)
451	NA	PAH-L	PAH-L	PAH Low
452	NA	PAH-H	PAH-H	PAH High
501	257.5	PCB 1016	PCB 1016	PCB 1016
502	196	PCB 1221	PCB 1221	PCB 1221
503	219	PCB 1232	PCB 1232	PCB 1232
504	258	PCB 1242	PCB 1242	PCB 1242
505	289	PCB 1248	PCB 1248	PCB 1248
506	326	PCB 1254	PCB 1254	PCB 1254
507	371	PCB 1260	PCB 1260	PCB 1260
508	NA	PCB(17)	PCB-T	TOTAL PCBS
601	194.19	DM PH	DIMP	Dimethyl Phthalate
602	NA	NA	DIMBP	Dibutyl Phthalate
603	NA	NA	DEHP	Diethyl Hexylphthalate
604	NA	NA	2FLUOROBIP	2 Fluorobiphenyl
605	NA	NA	NBNZ	Nitrobenzene
606	312	BBPh	BUTBNZ PHT	Butyl Benzyl Phthalate
607	390.54	DnOPh	2NOCTP	Di-n-octylphthalate
608	390.54	BisPh	B2ETHXPHTH	Bis(2-ethylhexyl)Phthalate
701	364.92	Aldrin	ALDRIN	Aldrin
702	291	BHC-a	6CL-CHX-A	Hexachlorocyclohexane-alpha

Appendix 2c (continued)

703	291	BHC-b	6CL-CHX-B	Hexachlorocyclohexane-beta
704	291	BHC-d	6CL-CHX-D	Hexachlorocyclohexane-delta
705	291	BHC-g	6CL-CHX-G	Hexachlorocyclohexane-gamma
706	410	Chlordane-trans	CHLORDAN-G	trans-chlordane
707	410	Chlordane-cis	CHLORDAN-A	cis-chlordane
708	320	4,4,DDD	DDD	4,4,DDD
709	318	4,4,DDE	DDE	4,4,DDE
710	354.6	4,4,DDT	DDT	4,4,DDT
711	381	Dieldrin	DIELDRIN	Dieldrin
712	407	Endosulfan I	ENDOSLFN-A	Endosulfan-alpha
713	407	Endosulfan II	ENDOSLFN-B	Endosulfan-beta
714	421	Endosulfan sulph.	ENDOSLFN-S	Endosulfan sulphate
715	381	Endrin	ENDRIN	Endrin
716	380.92	Endrin Aldehyde	ENDRIN-ALD	Endrin Aldehyde
717	380.92	Endrin Ketone	ENDRIN-KETONE	Endrin Ketone
718	373	Heptachlor	HEPTACHLOR	Heptachlor
719	389	Heptachlor epox.	HEPCL_EPOX	Heptachlor epoxide
720	414	Toxaphene	TOXAPHENE	Toxaphene
721	346	Methoxychlor	METHOXYCL	Methoxychlor
900	NA	NA	BENZOIC_AC	NA
901	NA	NA	PCT_FINE	NA
902	NA	NA	BARIUM	NA
903	NA	NA	ANTIMONY	NA
904	NA	NA	CALCIUM	NA
905	NA	NA	COBALT	NA
906	NA	NA	MAGNESIUM	NA
907	NA	NA	POTASSIUM	NA
908	NA	NA	SODIUM	NA
909	NA	NA	VANADIUM	NA
910	NA	NA	12-2CLETHE	NA
911	NA	NA	2-BUTANONE	NA
912	NA	NA	ACETONE	NA
913	NA	NA	CHLOROFORM	NA
914	NA	NA	METHYLE_CL	NA
915	NA	NA	TOLUENE	NA
916	NA	NA	3CLETENE	NA
917	NA	NA	CHLORDANE	NA
918	NA	NA	ENDOSULFAN	NA
920	NA	NA	THALLIUM	NA
921	NA	NA	PCT_MOIS	NA
922	NA	NA	PH	NA
923	NA	NA	CYANIDE	NA
924	NA	NA	DDD-SUM	NA
925	NA	NA	DDE-SUM	NA

Appendix 2d Sample codes.

<u>Location name</u>	<u>Letter</u>	<u>Sample number</u>	<u>Sample code</u>
Buffalo River	B	202	BR-1-01-01-G-1-0
Buffalo River	B	204	BR-1-03-01-G-1-0
Buffalo River	B	208	BR-1-07-01-G-1-0
Buffalo River	B	209	BR-1-08-01-G-1-0
Buffalo River	B	210	BR-1-09-01-G-1-0
Buffalo River	B	201	BR-1-CO
Clark Fork	C	802	CF-1-01
Clark Fork	C	803	CF-1-02
Clark Fork	C	804	CF-1-03
Clark Fork	C	805	CF-1-04
Clark Fork	C	806	CF-1-05
Clark Fork	C	807	CF-1-06
Clark Fork	C	801	CF-1-CO
Indiana Harbor	I	102	IH-1-03-01-G-1-0
Indiana Harbor	I	103	IH-1-04-01-G-1-0
Indiana Harbor	I	105	IH-1-06-01-G-1-0
Indiana Harbor	I	106	IH-1-07-01-G-1-0
Indiana Harbor	I	101	IH-1-CO
Mobile Bay	M	1002	MB-1-01
Mobile Bay	M	1003	MB-1-02
Mobile Bay	M	1004	MB-1-03
Mobile Bay	M	1005	MB-1-04
Mobile Bay	M	1001	MB-1-RE
Milltown	R	702	MR-1-01
Milltown	R	703	MR-1-02
Milltown	R	704	MR-1-07
Milltown	R	705	MR-1-11
Milltown	R	706	MR-1-17
Milltown	R	707	MR-1-19
Milltown	R	708	MR-1-25
Milltown	R	701	MR-1-CO
Saginaw River-1	S	303	SR-1-03-01-G-1-0
Saginaw River-1	S	305	SR-1-06-01-G-1-0
Saginaw River-1	S	308	SR-1-10-01-G-1-0
Saginaw River-1	S	301	SR-1-CO
Saginaw River-3	G	402	SR-3-01-01-G-1-0
Saginaw River-3	G	403	SR-3-02-01-G-1-0
Saginaw River-3	G	404	SR-3-05-01-G-1-0
Saginaw River-3	G	405	SR-3-06-01-G-1-0
Saginaw River-3	G	406	SR-3-08-01-G-1-0
Saginaw River-3	G	407	SR-3-16-01-G-1-0
Saginaw River-3	G	408	SR-3-24-01-G-1-0
<u>Location name</u>	<u>Letter</u>	<u>Sample number</u>	<u>Sample code</u>

aginaw River-3	G	401	SR-3-CO
Tabbs Bay	N	1102	TB-1-01
Tabbs Bay	N	1103	TB-1-02
Tabbs Bay	N	1104	TB-1-03
Tabbs Bay	N	1105	TB-1-04
Tabbs Bay	N	1101	TB-1-RE
Trinity River	T	902	TR-1-01
Trinity River	T	903	TR-1-02
Trinity River	T	904	TR-1-03
Trinity River	T	905	TR-1-04
Trinity River	T	901	TR-1-CO
Upper Mississippi	U	603	UM-1-01
Upper Mississippi	U	604	UM-1-02
Upper Mississippi	U	605	UM-1-03
Upper Mississippi	U	601	UM-1-CO
Upper Mississippi	U	602	UM-1-RE
Waukengen Harbor	W	503	WH-1-01
Waukengen Harbor	W	504	WH-1-02
Waukengen Harbor	W	501	WH-1-CO
Waukengen Harbor	W	502	WH-1-RE

Appendix 3a Summary of sediment effect concentrations (SECs) calculated using dry-weight concentrations and listed by chemical, test type, and sample type for the entire database.

NUMCODE	Numerical code for chemical (Appendix 2c)
CHEMCODE	Chemistry code for chemical (Appendix 2c)
TEST	Toxicity test (HA14 = <i>Hyalella azeteca</i> 14-d test; HA28 = <i>Hyalella azteca</i> 28-d test; CR-14 = <i>Chironomus riparius</i> 14-d test)
SAMPTYP	BT = total extraction of sediment; BS = weak acid digestion of sediment (SEM metals); PW = pore water
UNITS	Chemical concentrations
SEC	Sediment effect concentrations (NR = not reported)
C	An "x" indicates SECs which correctly classify <70% of the samples correctly. An "@" indicates an unreliable SEC (e.g., less than five of the samples were designated as toxic for the chemical or the number of toxic samples with concentrations below the SEC was greater than the number of toxic samples with concentrations above the SEC).
N	Total number of samples used to calculate each SEC.
TOX	Number of toxic samples.
EFFECT	Number of toxic samples where the concentration of a chemical was greater than the mean concentration of the chemical in the non-toxic samples at a site.
HIT	Number of samples with concentrations greater than the SEC.
TOTAL	Percentage samples correctly classified as toxic.
CORRECT	Percentage of toxic samples correctly classified as toxic (toxic sample and hit).
TOXHIT	Percentage of non-toxic samples correctly classified as not toxic (non-toxic sample and no hit).
NOTNOT	Percentage of non-toxic samples incorrectly classified as toxic (Type I error; non-toxic sample and hit [false positive]).
NOTHIT	Percentage of toxic samples incorrectly classified as not toxic (Type II error; toxic sample and no hit [false negative]).
TOXNOT	Percentage of toxic samples incorrectly classified as not toxic (Type II error; toxic sample and no hit [false negative]).

APPENDIX 3A: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRES USING ALL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT
							N	TOX	EFFECT	HIT				
101 TOC		CR14	BT	%	ERL X	2.67 42	11	8	17	67	17	50	24	10
					ERM	5.65 42	11	8	7	76	10	67	7	17
					TEL X	2.04 42	11	8	20	64	19	45	29	7
					PEL	4.38 42	11	8	8	79	12	67	7	14
					NEC	8.90 42	11	8	2	74	2	71	2	24
					NERM X	1.56 42	.	.	.	.	.	.	.	.
					NERH X	3.40 42	.	.	.	.	.	.	.	.
101 TOC		HA14	BT	%	ERL	1.70 32	13	12	17	81	38	44	16	3
					ERM	4.65 32	13	12	6	78	19	59	.	22
					TEL	1.30 32	13	12	18	84	41	44	16	.
					PEL	3.86 32	13	12	7	75	19	56	3	22
					NEC	4.00 32	13	12	7	75	19	56	3	22
					NERM X	1.00 32	.	.	.	.	.	.	.	.
					NERH X	3.20 32	.	.	.	.	.	.	.	.
101 TOC		HA28	BT	%	ERL X	1.70 62	24	17	33	60	26	34	27	13
					ERM X	3.00 62	24	17	20	58	15	44	18	24
					TEL X	1.49 62	24	17	33	60	26	34	27	13
					PEL X	3.29 62	24	17	16	61	13	48	13	26
					NEC X	9.00 62	24	17	2	61	2	60	2	37
					NERM X	1.30 62	.	.	.	.	.	.	.	.
					NERH X	3.60 62	.	.	.	.	.	.	.	.
102 AVS		CR14	BT	UM/G	ERL	15.50 37	9	5	9	78	14	65	11	11
					ERM	33.50 37	9	5	4	81	8	73	3	16
					TEL X	8.26 37	9	5	13	68	14	54	22	11
					PEL	20.87 37	9	5	5	78	8	70	5	16
					NEC @	161.00 37	9	5	1	73	.	73	3	24
					NERM X	4.40 37	.	.	.	.	.	.	.	.
					NERH X	13.00 37	.	.	.	.	.	.	.	.
102 AVS		HA14	BT	UM/G	ERL	5.10 22	11	10	12	77	41	36	14	9
					ERM	15.60 22	11	10	5	73	23	50	.	27
					TEL	3.46 22	11	10	13	82	45	36	14	5
					PEL	9.67 22	11	10	6	77	27	50	.	23
					NEC	8.90 22	11	10	7	73	27	45	5	23
					NERM X	2.35 22	.	.	.	.	.	.	.	.
					NERH X	6.00 22	.	.	.	.	.	.	.	.
102 AVS		HA28	BT	UM/G	ERL X	5.70 42	22	17	23	64	36	29	19	17
					ERM X	15.60 42	22	17	11	64	21	43	5	31
					TEL X	4.27 42	22	17	25	69	40	29	19	12
					PEL X	14.02 42	22	17	13	69	26	43	5	26
					NEC X	19.20 42	22	17	8	62	17	45	2	36
					NERM X	3.20 42	.	.	.	.	.	.	.	.
					NERH X	12.60 42	.	.	.	.	.	.	.	.
104 CLAY	CR14	BT	%		NR X	.	23	1	.	.	.	.	.	.
104 CLAY	HA14	BT	%		NR X	.	13	.	.	.	.	.	.	.
104 CLAY	HA28	BT	%		NR X	.	38	4	.	.	.	.	.	.
105 SAND		CR14	BT	%	ERL X	16.00 42	11	8	31	38	19	19	55	7
					ERM X	32.95 42	11	8	26	36	12	24	50	14
					TEL X	29.24 42	11	8	27	33	12	21	52	14
					PEL X	49.11 42	11	8	22	36	7	29	45	19
					NEC @	98.50 42	11	8	1	71	.	71	2	26
					NERM X	53.45 42	.	.	.	.	.	.	.	.
					NERH X	73.20 42	.	.	.	.	.	.	.	.
105 SAND		HA14	BT	%	ERL X	15.60 32	13	12	23	56	34	22	38	6
					ERM X	32.95 32	13	12	17	44	19	25	34	22
					TEL X	25.60 32	13	12	19	44	22	22	38	19
					PEL X	46.49 32	13	12	14	47	16	31	28	25
					NEC X	98.50 32	13	12	1	56	.	56	3	41
					NERM X	42.00 32	.	.	.	.	.	.	.	.
					NERH X	65.60 32	.	.	.	.	.	.	.	.
105 SAND		HA28	BT	%	ERL X	16.70 57	24	20	42	51	33	18	40	9
					ERM X	53.45 57	24	20	24	51	18	33	25	25
					TEL X	28.08 57	24	20	38	47	28	19	39	14
					PEL X	61.26 57	24	20	15	60	14	46	12	28
					NEC X	98.50 57	24	20	1	56	.	56	2	42
					NERM X	47.20 57	.	.	.	.	.	.	.	.
					NERH X	70.20 57	.	.	.	.	.	.	.	.
106 WATER	CR14	BT	%		ERL X	44.10 42	11	9	22	60	19	40	33	7
					ERM X	46.70 42	11	9	18	55	12	43	31	14

APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
 SEC IN THRES USING ALL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
106	WATER	CR14	BT	%	TEL	X	42.88	42	11	9	23	57	19	38	36	7
					PEL	X	53.50	42	11	9	12	60	7	52	21	19
					NEC	@	76.40	42	11	9	1	71	.	71	2	26
					NERM	X	41.70	42	.	.	.	.	.	.	.	.
					NERH	X	61.30	42	.	.	.	.	.	.	.	.
106	WATER	HA14	BT	%	ERL	X	41.70	32	13	10	18	59	28	31	28	13
					ERM	X	46.30	32	13	10	13	50	16	34	25	25
					TEL	X	40.43	32	13	10	19	63	31	31	28	9
					PEL	X	50.55	32	13	10	9	50	9	41	19	31
					NEC	X	76.40	32	13	10	1	56	.	56	3	41
106	WATER	HA28	BT	%	NERM	X	39.20	32	.	.	.	.	.	.	.	.
					NERH	X	55.20	32	.	.	.	.	.	.	.	.
					ERL	X	44.10	57	24	15	29	53	23	30	28	19
					ERM	X	54.00	57	24	15	16	58	14	44	14	28
					TEL	X	42.44	57	24	15	31	49	23	26	32	19
107	SILT	CR14	BT	%	PEL	X	54.60	57	24	15	14	54	11	44	14	32
					NEC	X	85.00	57	24	15	1	56	.	56	2	42
					NERM	X	40.85	57	.	.	.	.	.	.	.	.
					NERH	X	55.20	57	.	.	.	.	.	.	.	.
					NR	X	.	23	1	.	.	.	.	.	.	.
107	SILT	HA14	BT	%	NR	X	.	13	.	.	.	.	.	.	.	.
					NR	X	.	38	3	.	.	.	.	.	.	.
					NR	X	.	15	1	.	.	.	.	.	.	.
					NR	X	.	15	4	.	.	.	.	.	.	.
					NR	X	.	15	1	.	.	.	.	.	.	.
109	CEC	CR14	BT	MEQ/KG	NR	X	.	15	1	.	.	.	.	.	.	.
					ERL	X	12.70	15	8	5	11	53	40	13	33	13
					ERM	X	15.60	15	8	5	3	67	20	47	.	33
					TEL	X	12.85	15	8	5	9	53	33	20	27	20
					PEL	X	14.94	15	8	5	5	67	27	40	7	27
110	NH3P	CR14	BT	MG/L	NEC	X	15.20	15	8	5	5	67	27	40	7	27
					NERM	X	13.00	15	.	.	.	.	.	.	.	.
					NERH	X	14.30	15	.	.	.	.	.	.	.	.
					NR	X	.	36	3	.	.	.	.	.	.	.
					ERL	X	0.02	21	9	7	12	67	33	33	24	10
110	NH3P	HA14	BT	MG/L	ERM	X	0.27	21	9	7	4	76	19	57	.	24
					TEL	X	0.01	21	9	7	12	67	33	33	24	10
					PEL	X	0.10	21	9	7	4	76	19	57	.	24
					NEC	X	0.09	21	9	7	5	71	19	52	5	24
					NERM	X	0.01	21	.	.	.	.	.	.	.	.
110	NH3P	HA28	BT	MG/L	NERH	X	0.04	21	.	.	.	.	.	.	.	.
					ERL	X	0.02	41	20	16	24	71	39	32	20	10
					ERM	X	0.08	41	20	16	11	63	20	44	7	29
					TEL	X	0.01	41	20	16	25	68	39	29	22	10
					PEL	X	0.06	41	20	16	12	66	22	44	7	27
111	HSP	CR14	BT	MG/L	NEC	X	0.14	41	20	16	8	66	17	49	2	32
					NERM	X	0.01	41	.	.	.	.	.	.	.	.
					NERH	X	0.05	41	.	.	.	.	.	.	.	.
					NR	X	.	17	.	.	.	.	.	.	.	.
					NR	X	.	2	.	.	.	.	.	.	.	.
300	AL	CR14	BS	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
					NR	X	.	19	.	.	.	.	.	.	.	.
					NR	X	.	5	.	.	.	.	.	.	.	.
					NR	X	.	5	.	.	.	.	.	.	.	.
					NR	X	.	20	4	.	.	.	.	.	.	.
300	AL	HA14	BT	NG/G	ERL	X	13500000.00	25	11	5	23	44	40	4	52	4
					ERM	X	58030000.00	25	11	5	10	64	24	40	16	20
					TEL	X	25519404.38	25	11	5	21	44	36	8	48	8
					PEL	X	59572012.30	25	11	5	7	52	12	40	16	32

APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
 SEC IN THRES USING ALL DATA

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NUMCODE	CHEM CODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
							N	TOX	EFFECT	HIT					
300 AL		HA28	BT	NG/G	NEC X	73160000.00	25	11	5	1	52	.	52	4	44
					NERM X	48240000.00	25	.	.	.	.	.	.	.
					NERH X	61155000.00	25	.	.	.	.	.	.	.
301 SILVER		CR14	BT	NG/G	NR X	.	19	2	.	.	.	.	.	.
301 SILVER		CR14	PW	UG/L	NR X	.	16	.	.	.	.	.	.	.
301 SILVER		HA14	BT	NG/G	NR X	.	19	1	.	.	.	.	.	.
301 SILVER		HA14	PW	UG/L	NR X	.	16	.	.	.	.	.	.	.
301 SILVER		HA28	BT	NG/G	NR X	.	19	2	.	.	.	.	.	.
301 SILVER		HA28	PW	UG/L	NR X	.	16	.	.	.	.	.	.	.
302 ARSENIC		CR14	BS	NG/G	NR X	.	19	1	.	.	.	.	.	.
302 ARSENIC		CR14	BT	NG/G	ERL X	32000.00	42	11	6	20	60	17	43	31	10
					ERM X	57000.00	42	11	6	7	71	7	64	10	19
					TEL X	21762.35	42	11	6	22	55	17	38	36	10
					PEL X	54022.22	42	11	6	8	69	7	62	12	19
					NEC @	404000.00	42	11	6	1	71	.	71	2	26
					NERM X	14800.00	42	.	.	.	.	.	.	.	.
					NERH X	51200.00	42	.	.	.	.	.	.	.	.
302 ARSENIC		CR14	PW	UG/L	NR X	.	35	3	.	.	.	.	.	.	.
302 ARSENIC		HA14	BS	NG/G	NR X	.	5	.	.	.	.	.	.	.	.
302 ARSENIC		HA14	BT	NG/G	ERL X	12100.00	32	13	10	19	69	34	34	25	6
					ERM X	33000.00	32	13	10	10	66	19	47	13	22
					TEL X	11244.78	32	13	10	20	66	34	31	28	6
					PEL X	39466.44	32	13	10	9	63	16	47	13	25
					NEC X	92900.00	32	13	10	2	59	3	56	3	38
					NERM X	10450.00	32	.	.	.	.	.	.	.	.
					NERH X	47200.00	32	.	.	.	.	.	.	.	.
302 ARSENIC		HA14	PW	UG/L	ERL	1.70	21	10	7	8	71	29	43	10	19
					ERM X	2.30	21	10	7	5	67	19	48	5	29
					TEL X	1.37	21	10	7	10	62	29	33	19	19
					PEL X	1.92	21	10	7	5	67	19	48	5	29
					NEC X	2.30	21	10	7	5	67	19	48	5	29
					NERM X	1.10	21	.	.	.	.	.	.	.	.
					NERH X	1.60	21	.	.	.	.	.	.	.	.
302 ARSENIC		HA28	BS	NG/G	ERL	7400.00	20	8	7	9	75	30	45	15	10
					ERM	24800.00	20	8	7	4	80	20	60	.	20
					TEL	3331.67	20	8	7	10	80	35	45	15	5
					PEL	16365.82	20	8	7	5	75	20	55	5	20
					NEC	23800.00	20	8	7	5	75	20	55	5	20
					NERM X	1500.00	20	.	.	.	.	.	.	.	.
					NERH X	10800.00	20	.	.	.	.	.	.	.	.
302 ARSENIC		HA28	BT	NG/G	ERL X	13100.00	52	24	16	27	63	31	33	21	15
					ERM X	49600.00	52	24	16	11	63	15	48	6	31
					TEL X	10797.68	52	24	16	32	62	35	27	27	12
					PEL X	48385.12	52	24	16	11	63	15	48	6	31
					NEC X	102000.00	52	24	16	2	54	2	52	2	44
					NERM X	8900.00	52	.	.	.	.	.	.	.	.
					NERH X	47200.00	52	.	.	.	.	.	.	.	.
302 ARSENIC		HA28	PW	UG/L	ERL X	1.70	36	19	16	22	69	42	28	19	11
					ERM X	6.80	36	19	16	12	58	22	36	11	31
					TEL X	1.37	36	19	16	24	64	42	22	25	11
					PEL X	10.58	36	19	16	10	58	19	39	8	33
					NEC X	53.70	36	19	16	4	53	8	44	3	44
					NERM X	1.10	36	.	.	.	.	.	.	.	.
					NERH X	16.45	36	.	.	.	.	.	.	.	.
303 CADMIUM		CR14	BS	NG/G	ERL X	787.00	37	9	6	17	62	16	46	30	8
					ERM X	1405.00	37	9	6	12	59	8	51	24	16
					TEL X	514.99	37	9	6	21	57	19	38	38	5
					PEL X	1817.07	37	9	6	9	62	5	57	19	19
					NEC @	31300.00	37	9	6	1	73	.	73	3	24
					NERM X	337.00	37	.	.	.	.	.	.	.	.
					NERH X	2350.00	37	.	.	.	.	.	.	.	.
303 CADMIUM		CR14	BT	NG/G	ERL	9100.00	42	11	7	7	86	14	71	2	12
					ERM	11700.00	42	11	7	5	81	10	71	2	17

APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THRES USING ALL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	TOXHIT	NOTHIT	NOTNOT	TOXNOT	
							N	TOX	EFFECT	HIT					
303 CADMIUM		CR14	BT	NG/G	TEL X	2893.44	42	11	7	16	69	17	52	21	10
					PEL	6623.82	42	11	7	9	81	14	67	7	12
					NEC	41100.00	42	11	7	2	74	2	71	2	24
					NERM X	920.00	42								
					NERH X	3750.00	42								
303 CADMIUM		CR14	PW	UG/L	ERL X	0.19	35	9	6	15	66	17	49	26	9
					ERM	1.05	35	9	6	5	77	9	69	6	17
					TEL X	0.12	35	9	6	16	63	17	46	29	9
					PEL	0.52	35	9	6	7	83	14	69	6	11
					NEC	2.35	35	9	6	3	77	6	71	3	20
					NERM X	0.08	35								
					NERH X	0.26	35								
303 CADMIUM		HA14	BS	NG/G	ERL	337.00	23	11	10	12	78	39	39	13	9
					ERM	1068.00	23	11	10	5	74	22	52		26
					TEL	237.23	23	11	10	12	78	39	39	13	9
					PEL	774.74	23	11	10	7	74	26	48	4	22
					NEC X	899.00	23	11	10	6	70	22	48	4	26
					NERM X	167.00	23								
					NERH X	562.00	23								
303 CADMIUM		HA14	BT	NG/G	ERL	700.00	32	13	11	19	81	41	41	19	
					ERM	5200.00	32	13	11	7	75	19	56	3	22
					TEL	591.61	32	13	11	19	81	41	41	19	
					PEL	3224.90	32	13	11	8	78	22	56	3	19
					NEC	8000.00	32	13	11	6	72	16	56	3	25
					NERM X	500.00	32								
					NERH X	2000.00	32								
303 CADMIUM		HA14	PW	UG/L	ERL X	0.10	21	10	6	10	62	29	33	19	19
					ERM X	0.92	21	10	6	3	67	14	52		33
					TEL X	0.09	21	10	6	10	62	29	33	19	19
					PEL	0.43	21	10	6	4	71	19	52		29
					NEC X	0.20	21	10	6	8	52	19	33	19	29
					NERM X	0.08	21								
					NERH X	0.20	21								
303 CADMIUM		HA28	BS	NG/G	ERL	562.00	38	19	16	21	74	39	34	16	11
					ERM X	1405.00	38	19	16	12	66	24	42	8	26
					TEL	314.06	38	19	16	23	74	42	32	18	8
					PEL X	1494.64	38	19	16	11	63	21	42	8	29
					NEC X	3870.00	38	19	16	3	53	5	47	3	45
					NERM X	175.50	38								
					NERH X	1590.00	38								
303 CADMIUM		HA28	BT	NG/G	ERL X	700.00	62	24	18	35	66	31	35	26	8
					ERM	3875.00	62	24	18	12	71	15	56	5	24
					TEL X	583.27	62	24	18	35	66	31	35	26	8
					PEL	3246.54	62	24	18	14	74	18	56	5	21
					NEC	8000.00	62	24	18	8	71	11	60	2	27
					NERM X	486.00	62								
					NERH X	2720.00	62								
303 CADMIUM		HA28	PW	UG/L	ERL X	0.19	36	19	10	15	56	25	31	17	28
					ERM X	1.05	36	19	10	5	61	14	47		39
					TEL X	0.12	36	19	10	16	58	28	31	17	25
					PEL X	0.46	36	19	10	7	67	19	47		33
					NEC X	0.36	36	19	10	8	64	19	44	3	33
					NERM X	0.08	36								
					NERH X	0.20	36								
304 CHROMIUM-T	CR14	BS	NG/G		ERL	3010.00	37	9	6	12	81	19	62	14	5
					ERM	31665.50	37	9	6	3	84	8	76		16
					TEL X	2275.35	37	9	6	17	68	19	49	27	5
					PEL	10265.61	37	9	6	6	86	14	73	3	11
					NEC	14975.00	37	9	6	6	86	14	73	3	11
					NERM X	1720.00	37								
					NERH X	3328.00	37								
304 CHROMIUM-T	CR14	BT	NG/G		ERL X	39300.00	42	11	8	25	62	24	38	36	2
					ERM	363000.00	42	11	8	4	83	10	74		17
					TEL X	39796.86	42	11	8	24	60	21	38	36	5
					PEL	159405.14	42	11	8	7	86	14	71	2	12
					NEC	312000.00	42	11	8	6	83	12	71	2	14
					NERM X	40300.00	42								
					NERH X	70000.00	42								
304 CHROMIUM-T	CR14	PW	UG/L		ERL X	0.40	35	9	6	31	26	20	6	69	6
					ERM	18.80	35	9	6	3	83	9	74		17

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APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
							N	TOX	EFFECT	HIT					
305 COPPER		HA14	BT	NG/G	NERH X	49400.00	32	.	.	.	.	.	.	.
305 COPPER		HA14	PW	UG/L	ERL	5.30	21	10	5	5	76	24	52	.	
					ERM X	19.80	21	10	5	3	67	14	52	.	
					TEL X	3.89	21	10	5	10	52	24	29	24	
					PEL	9.63	21	10	5	4	71	19	52	29	
					NEC X	4.68	21	10	5	10	52	24	29	24	
					NERM X	2.85	21	.	.	.	.	.	.	.
					NERH X	4.68	21	.	.	.	.	.	.	.
305 COPPER		HA28	BS	NG/G	ERL X	16965.00	38	19	10	13	63	24	39	11	26
					ERM X	20900.00	38	19	10	7	58	13	45	5	37
					TEL X	9248.65	38	19	10	22	50	29	21	29	21
					PEL X	50079.94	38	19	10	11	58	18	39	11	32
					NEC X	325000.00	38	19	10	4	55	8	47	3	42
					NERM X	5042.00	38	.	.	.	.	.	.	.	.
					NERH X	12000.00	38	.	.	.	.	.	.	.	.
305 COPPER		HA28	BT	NG/G	ERL	41300.00	52	24	21	26	73	35	38	15	12
					ERM X	187000.00	52	24	21	14	69	21	48	6	25
					TEL X	28012.50	52	24	21	29	71	37	35	19	10
					PEL X	101230.43	52	24	21	17	71	25	46	8	21
					NEC X	583000.00	52	24	21	3	56	4	52	2	42
					NERM X	19000.00	52	.	.	.	.	.	.	.	.
					NERH X	54800.00	52	.	.	.	.	.	.	.	.
305 COPPER		HA28	PW	UG/L	ERL X	5.30	36	19	11	16	64	31	33	14	22
					ERM X	19.80	36	19	11	7	61	17	44	3	36
					TEL X	4.43	36	19	11	22	47	31	17	31	22
					PEL X	13.16	36	19	11	11	67	25	42	6	28
					NEC X	35.60	36	19	11	5	56	11	44	3	42
					NERM X	3.70	36	.	.	.	.	.	.	.	.
					NERH X	8.75	36	.	.	.	.	.	.	.	.
306 IRON	CR14	BS	%		ERL	5.31	31	9	5	9	74	16	58	13	13
					ERM	8.49	31	9	5	4	77	10	68	3	19
					TEL X	3.81	31	9	5	12	65	16	48	23	13
					PEL	7.04	31	9	5	5	74	10	65	6	19
					NEC X	18.47	31	9	5	1	68	.	68	3	29
					NERM X	2.74	31	.	.	.	.	.	.	.	.
					NERH X	5.84	31	.	.	.	.	.	.	.	.
306 IRON	CR14	BT	%		NR X	.	31	3	.	.	.	.	.	.	.
306 IRON	HA14	BS	%		ERL	3.57	17	10	5	5	71	29	41	.	29
					ERM X	5.81	17	10	5	3	59	18	41	.	41
					TEL X	2.19	17	10	5	10	41	29	12	29	29
					PEL X	3.99	17	10	5	4	65	24	41	.	35
					NEC X	2.74	17	10	5	10	41	29	12	29	29
					NERM X	1.34	17	.	.	.	.	.	.	.	.
					NERH X	2.74	17	.	.	.	.	.	.	.	.
306 IRON	HA14	BT	%		NR X	.	17	2	.	.	.	.	.	.	.
306 IRON	HA28	BS	%		ERL X	5.19	32	19	8	10	53	22	31	9	38
					ERM X	7.15	32	19	8	5	50	13	38	3	47
					TEL X	3.77	32	19	8	12	59	28	31	9	31
					PEL X	5.71	32	19	8	8	47	16	31	9	44
					NEC X	7.31	32	19	8	5	50	13	38	3	47
					NERM X	2.74	32	.	.	.	.	.	.	.	.
					NERH X	4.56	32	.	.	.	.	.	.	.	.
306 IRON	HA28	BT	%		ERL X	19.70	37	22	7	14	57	27	30	11	32
					ERM X	28.00	37	22	7	5	49	11	38	3	49
					TEL X	18.84	37	22	7	14	57	27	30	11	32
					PEL X	24.76	37	22	7	6	46	11	35	5	49
					NEC X	28.99	37	22	7	3	43	5	38	3	54
					NERM X	18.02	37	.	.	.	.	.	.	.	.
					NERH X	21.89	37	.	.	.	.	.	.	.	.
307 MERCURY	CR14	BT	NG/G		NR X	.	19	1	.	.	.	.	.	.	.
307 MERCURY	CR14	PW	UG/L		NR X	.	16	2	.	.	.	.	.	.	.
307 MERCURY	HA14	BT	NG/G		NR X	.	19	1
307 MERCURY	HA14	PW	UG/L		NR X	.	16	1
307 MERCURY	HA28	BT	NG/G		NR X	.	19	3

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APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C.	CONC	#	#	#	TOTAL	TOXHIT	NOTHIT	NOTNOT	TOXNOT	
							N	TOX	EFFECT	HIT					
310 LEAD		HA28	BT	NG/G	ERL	55000.00	62	24	19	26	74	27	47	15	11
					ERM	98700.00	62	24	19	12	74	16	58	3	23
					TEL	37229.02	62	24	19	32	71	31	40	21	8
					PEL	81743.44	62	24	19	18	77	23	55	6	16
					NEC	127000.00	62	24	19	8	71	11	60	2	27
					NERM X	25200.00	62								
					NERH X	67700.00	62								
310 LEAD		HA28	PW	UG/L	ERL X	0.70	36	19	15	19	67	36	31	17	17
					ERM X	0.90	36	19	15	14	58	25	33	14	28
					TEL X	0.46	36	19	15	19	67	36	31	17	17
					PEL X	1.77	36	19	15	10	53	17	36	11	36
					NEC X	4.10	36	19	15	7	61	17	44	3	36
					NERM X	0.30	36								
					NERH X	3.50	36								
311 SELENIUM	CR14	BT	NG/G		NR X	.	19								
311 SELENIUM	HA14	BT	NG/G		NR X	.	19								
311 SELENIUM	HA28	BT	NG/G		NR X	.	19	2							
312 ZINC	CR14	BS	NG/G		ERL X	12747.00	37	9	6	26	38	16	22	54	8
					ERM X	107991.50	37	9	6	13	57	8	49	27	16
					TEL X	13358.82	37	9	6	25	35	14	22	54	11
					PEL X	270987.49	37	9	6	12	54	5	49	27	19
					NEC @	8873000.00	37	9	6	1	73	.	73	3	24
					NERM X	14000.00	37								
					NERH X	680000.00	37								
312 ZINC	CR14	BT	NG/G		ERL X	381000.00	42	11	8	18	64	17	48	26	10
					ERM	2750000.00	42	11	8	5	81	10	71	2	17
					TEL X	280832.69	42	11	8	23	57	19	38	36	7
					PEL X	1532481.65	42	11	8	6	83	12	71	2	14
					NEC @	10090000.00	42	11	8	1	71	.	71	2	26
					NERM X	207000.00	42								
					NERH X	854000.00	42								
312 ZINC	CR14	PW	UG/L		ERL X	6.30	35	9	6	19	54	17	37	37	9
					ERM	55.20	35	9	6	7	71	9	63	11	17
					TEL X	4.96	35	9	6	19	54	17	37	37	9
					PEL	52.90	35	9	6	7	71	9	63	11	17
					NEC @	2630.00	35	9	6	1	71	.	71	3	26
					NERM X	3.90	35								
					NERH X	50.70	35								
312 ZINC	HA14	BS	NG/G		ERL X	12747.00	23	11	6	12	52	26	26	26	22
					ERM X	84066.00	23	11	6	3	65	13	52	.	35
					TEL X	11901.99	23	11	6	13	48	26	22	30	22
					PEL X	34306.33	23	11	6	4	70	17	52	.	30
					NEC X	17388.00	23	11	6	6	70	22	48	4	26
					NERM X	11113.00	23								
					NERH X	14000.00	23								
312 ZINC	HA14	BT	NG/G		ERL	159000.00	32	13	12	17	81	38	44	16	3
					ERM	422000.00	32	13	12	7	75	19	56	3	22
					TEL	94150.15	32	13	12	20	78	41	38	.	
					PEL	384042.97	32	13	12	7	75	19	56	3	22
					NEC	541000.00	32	13	12	6	72	16	56	3	25
					NERM X	55750.00	32								
					NERH X	349500.00	32								
312 ZINC	HA14	PW	UG/L		ERL	6.30	21	10	5	6	71	24	48	5	24
					ERM X	49.60	21	10	5	3	67	14	52	.	33
					TEL X	3.37	21	10	5	11	48	24	24	29	24
					PEL	13.91	21	10	5	4	71	19	52	.	29
					NEC X	10.70	21	10	5	5	67	19	48	5	29
					NERM X	1.80	21								
					NERH X	3.90	21								
312 ZINC	HA28	BS	NG/G		ERL X	65893.00	38	19	11	15	68	29	39	11	21
					ERM X	408000.00	38	19	11	10	61	18	42	8	32
					TEL X	30372.72	38	19	11	15	68	29	39	11	21
					PEL X	346340.87	38	19	11	10	61	18	42	8	32
					NEC X	1064000.00	38	19	11	3	53	5	47	3	45
					NERM X	14000.00	38								
					NERH X	294000.00	38								
312 ZINC	HA28	BT	NG/G		ERL X	113000.00	62	24	20	37	63	31	32	29	8
					ERM	547000.00	62	24	20	16	74	19	55	6	19

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
							N	TOX	EFFECT	HIT					
312	ZINC	HA28	BT	NG/G	TEL X	98091.54	62	24	20	39	63	32	31	31	6
					PEL	543991.73	62	24	20	16	74	19	55	6	19
					NEC X	1300000.00	62	24	20	7	69	10	60	2	29
					NERM X	85150.00	62								
					NERH X	541000.00	62								
312	ZINC	HA28	PW	UG/L	ERL X	19.00	36	19	8	14	64	28	36	11	25
					ERM X	121.90	36	19	8	6	53	11	42	6	42
					TEL X	8.61	36	19	8	18	64	33	31	17	19
					PEL X	59.66	36	19	8	7	56	14	42	6	39
					NEC X	166.00	36	19	8	5	56	11	44	3	42
313	METHYL-HG	CR14	BT	NG/G	NR X	.	12	.	.	.	.	.	.	.	.
					NR X	.	12	.	.	.	.	.	.	.	.
					NR X	.	12	1	.	.	.	.	.	.	.
					NR X	.	12	1	.	.	.	.	.	.	.
					NR X	.	12	.	.	.	.	.	.	.	.
314	TBT	CR14	BT	NG/G	NR X	.	12	1	.	.	.	.	.	.	.
					NR X	.	12	.	.	.	.	.	.	.	.
					NR X	.	12	3	.	.	.	.	.	.	.
					NR X	.	12	2	.	.	.	.	.	.	.
					NR X	.	12	1	.	.	.	.	.	.	.
316	MBT	CR14	BT	NG/G	NR X	.	12	1	.	.	.	.	.	.	.
					NR X	.	12	.	.	.	.	.	.	.	.
					NR X	.	12	3	.	.	.	.	.	.	.
					NR X	.	12	2	.	.	.	.	.	.	.
					NR X	.	12	1	.	.	.	.	.	.	.
399	SEMAVS	CR14	BS		NR X	.	31	4	.	.	.	.	.	.	.
					NR X	.	18	.	.	.	.	.	.	.	.
					NR X	.	31	4	.	.	.	.	.	.	.
					NR X	.	18	.	.	.	.	.	.	.	.
					NR X	.	31	4	.	.	.	.	.	.	.
401	14-2CLBNZ	CR14	BT	NG/G	NR X	.	19	2	.	.	.	.	.	.	.
					NR X	.	19	1	.	.	.	.	.	.	.
					NR X	.	19	3	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
402	12-2CLBNZ	CR14	BT	NG/G	NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
403	13-2CLBNZ	CR14	BT	NG/G	NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
					NR X	.	7	.	.	.	.	.	.	.	.
404	NAPHTHALENE	CR14	BT	NG/G	ERL	55.00	42	11	8	18	79	24	55	19	2
					ERM	1890.00	42	11	8	5	81	10	71	2	17
					TEL	34.39	42	11	8	21	76	26	50	24	
					PEL	687.39	42	11	8	5	81	10	71	2	17
					NEC @	20000.00	42	11	8	1	71	.	71	2	26
					NERM X	21.50	42	.	.	.	.	.	.	.	.
					NERH X	250.00	42	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA14	BT	NG/G	ERL	55.00	32	13	12	18	78	38	41	19	3
					ERM	325.00	32	13	12	6	78	19	59	.	22
					TEL	32.75	32	13	12	20	78	41	38	22	.
					PEL	285.04	32	13	12	7	75	19	56	3	22
					NEC	290.00	32	13	12	7	75	19	56	3	22
					NERM X	19.50	32	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA28	BT	NG/G	ERL X	13.00	62	24	18	46	55	34	21	40	5
					ERM X	97.50	62	24	18	18	61	15	47	15	24

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
413	BAA	HA28	BT	NG/G	ERL	X	19.00	62	24	19	38	55	27	27	34	11
					ERM	X	300.00	62	24	19	16	68	16	52	10	23
					TEL	X	15.72	62	24	19	39	56	29	27	34	10
					PEL	X	284.60	62	24	19	16	68	16	52	10	23
					NEC	X	3000.00	62	24	19	6	68	8	60	2	31
					NERM	X	13.00	62	.	.	.	.	.	.	.	.
					NERH	X	270.00	62	.	.	.	.	.	.	.	.
414	CHRYSENE	CR14	BT	NG/G	ERL		500.00	42	11	7	10	88	19	69	5	7
					ERM		5200.00	42	11	7	4	83	10	74	.	17
					TEL		122.47	42	11	7	19	71	21	50	24	5
					PEL		1512.61	42	11	7	5	81	10	71	2	17
					NEC		4000.00	42	11	7	5	81	10	71	2	17
					NERM	X	30.00	42	.	.	.	.	.	.	.	.
					NERH	X	440.00	42	.	.	.	.	.	.	.	.
414	CHRYSENE	HA14	BT	NG/G	ERL		330.00	32	13	13	16	84	38	47	13	3
					ERM		690.00	32	13	13	7	81	22	59	.	19
					TEL	X	135.94	32	13	13	21	69	38	31	28	3
					PEL		551.00	32	13	13	9	81	25	56	3	16
					NEC		600.00	32	13	13	9	81	25	56	3	16
					NERM	X	56.00	32	.	.	.	.	.	.	.	.
					NERH	X	440.00	32	.	.	.	.	.	.	.	.
414	CHRYSENE	HA28	BT	NG/G	ERL	X	30.00	62	24	17	36	52	24	27	34	15
					ERM		500.00	62	24	17	11	73	15	58	3	24
					TEL	X	26.83	62	24	17	38	52	26	26	35	13
					PEL	X	406.20	62	24	17	16	68	16	52	10	23
					NEC		3000.00	62	24	17	6	68	8	60	2	31
					NERM	X	24.00	62	.	.	.	.	.	.	.	.
					NERH	X	330.00	62	.	.	.	.	.	.	.	.
415	BBF	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
415	BBF	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
415	BBF	HA28	BT	NG/G	NR	X	.	19	4	.	.	.	.	.	.	.
416	BKF	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
416	BKF	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
416	BKF	HA28	BT	NG/G	NR	X	.	19	4	.	.	.	.	.	.	.
417	BAP	CR14	BT	NG/G	ERL		210.00	42	11	6	18	74	21	52	21	5
					ERM		8500.00	42	11	6	3	81	7	74	.	19
					TEL	X	51.23	42	11	6	20	69	21	48	26	5
					PEL		1724.82	42	11	6	5	81	10	71	2	17
					NEC		5800.00	42	11	6	5	81	10	71	2	17
					NERM	X	12.50	42	.	.	.	.	.	.	.	.
					NERH	X	350.00	42	.	.	.	.	.	.	.	.
417	BAP	HA14	BT	NG/G	ERL		350.00	32	13	11	11	88	31	56	3	9
					ERM		620.00	32	13	11	6	78	19	59	.	22
					TEL		119.79	32	13	11	19	75	38	38	22	3
					PEL		393.70	32	13	11	10	84	28	56	3	13
					NEC		440.00	32	13	11	10	84	28	56	3	13
					NERM	X	41.00	32	.	.	.	.	.	.	.	.
					NERH	X	250.00	32	.	.	.	.	.	.	.	.
417	BAP	HA28	BT	NG/G	ERL	X	84.00	62	24	14	25	60	19	40	21	19
					ERM		465.00	62	24	14	8	71	11	60	2	27
					TEL	X	32.40	62	24	14	31	53	21	32	29	18
					PEL		319.84	62	24	14	12	71	15	56	5	24
					NEC		1000.00	62	24	14	6	68	8	60	2	31
					NERM	X	12.50	62	.	.	.	.	.	.	.	.
					NERH	X	220.00	62	.	.	.	.	.	.	.	.
418	ICDP	CR14	BT	NG/G	ERL	X	30.00	42	11	8	23	67	24	43	31	2
					ERM		2800.00	42	11	8	5	81	10	71	2	17
					TEL	X	17.32	42	11	8	23	67	24	43	31	2
					PEL		836.66	42	11	8	5	81	10	71	2	17
					NEC		3800.00	42	11	8	5	81	10	71	2	17
					NERM	X	10.00	42	.	.	.	.	.	.	.	.
					NERH	X	250.00	42	.	.	.	.	.	.	.	.
418	ICDP	HA14	BT	NG/G	ERL	X	78.00	32	13	12	21	69	38	31	28	3
					ERM		410.00	32	13	12	6	78	19	59	.	22
					TEL	X	86.53	32	13	12	20	66	34	31	28	6
					PEL		326.50	32	13	12	6	78	19	59	.	22

**APPENDIX 3A: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRES USING ALL DATA**

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**APPENDIX 3A: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THRES USING ALL DATA**

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Appendix 3b Summary of sediment effect concentrations (SECs) calculated using dry-weight concentrations and listed by chemical, test type, and sample type for the Great Lakes database. See legend to Appendix 3a for a description of the headings.

APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
 SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC C	CONC	#	#	#	TOTAL	CORRECT	TOXHIT	NOTNOT	NOTHIT	TOXNOT
							N	TOX	EFFECT	HIT					
101 TOC		CR14	BT	%	ERL	3.70 27	11	7	10	79	14	64	10	12	
					ERM	5.70 27	11	7	7	76	10	67	7	17	
					TEL X	2.39 27	11	7	18	64	17	48	26	10	
					PEL	4.47 27	11	7	8	79	12	67	7	14	
					NEC	8.90 27	11	7	2	74	2	71	2	24	
					NERM X	1.55 27	.	.	.	.	.	.	.	.
					NERH X	3.50 27	.	.	.	.	.	.	.	.
101 TOC		HA14	BT	%	ERL	1.70 27	13	12	17	81	38	44	16	3	
					ERM	4.65 27	13	12	6	78	19	59	.	22	
					TEL X	1.30 27	13	12	18	84	41	44	16	.	
					PEL	3.98 27	13	12	7	75	19	56	3	22	
					NEC	4.00 27	13	12	7	75	19	56	3	22	
					NERM X	1.00 27	.	.	.	.	.	.	.	.
					NERH X	3.40 27	.	.	.	.	.	.	.	.
101 TOC		HA28	BT	%	ERL X	2.00 27	24	12	28	61	23	39	23	16	
					ERM X	4.65 27	24	12	11	66	11	55	6	27	
					TEL X	1.41 27	24	12	33	60	26	34	27	13	
					PEL X	3.98 27	24	12	13	63	11	52	10	27	
					NEC X	4.00 27	24	12	13	63	11	52	10	27	
					NERM X	1.00 27	.	.	.	.	.	.	.	.
					NERH X	3.40 27	.	.	.	.	.	.	.	.
102 AVS		CR14	BT	UM/G	ERL	15.50 22	9	5	9	78	14	65	11	11	
					ERM	33.50 22	9	5	4	81	8	73	3	16	
					TEL X	7.15 22	9	5	14	65	14	51	24	11	
					PEL	14.18 22	9	5	9	78	14	65	11	11	
					NEC @	161.00 22	9	5	1	73	.	73	3	24	
					NERM X	3.30 22	.	.	.	.	.	.	.	.
					NERH X	6.00 22	.	.	.	.	.	.	.	.
102 AVS		HA14	BT	UM/G	ERL	5.10 22	11	10	12	77	41	36	14	9	
					ERM	15.60 22	11	10	5	73	23	50	.	27	
					TEL X	3.46 22	11	10	13	82	45	36	14	5	
					PEL	9.67 22	11	10	6	77	27	50	.	23	
					NEC	8.90 22	11	10	7	73	27	45	5	23	
					NERM X	2.35 22	.	.	.	.	.	.	.	.
					NERH X	6.00 22	.	.	.	.	.	.	.	.
102 AVS		HA28	BT	UM/G	ERL X	5.10 22	22	11	25	69	40	29	19	12	
					ERM X	15.50 22	22	11	12	67	24	43	5	29	
					TEL X	3.64 22	22	11	26	67	40	26	21	12	
					PEL X	9.48 22	22	11	16	67	29	38	10	24	
					NEC X	8.90 22	22	11	17	64	29	36	12	24	
					NERM X	2.60 22	.	.	.	.	.	.	.	.
					NERH X	5.80 22	.	.	.	.	.	.	.	.
104 CLAY	CR14	BT	%		NR X	.	8	.	.	.	.	.	.	.
104 CLAY	HA14	BT	%		NR X	.	8	.	.	.	.	.	.	.
104 CLAY	HA28	BT	%		NR X	.	8	.	.	.	.	.	.	.
105 SAND		CR14	BT	%	ERL X	16.00 27	11	8	31	38	19	19	55	7	
					ERM X	32.95 27	11	8	26	36	12	24	50	14	
					TEL X	21.69 27	11	8	28	36	14	21	52	12	
					PEL X	49.11 27	11	8	22	36	7	29	45	19	
					NEC @	98.50 27	11	8	1	71	.	71	2	26	
					NERM X	29.40 27	.	.	.	.	.	.	.	.
					NERH X	73.20 27	.	.	.	.	.	.	.	.
105 SAND		HA14	BT	%	ERL X	15.60 27	13	12	23	56	34	22	38	6	
					ERM X	32.95 27	13	12	17	44	19	25	34	22	
					TEL X	21.42 27	13	12	19	44	22	22	38	19	
					PEL X	49.11 27	13	12	13	50	16	34	25	25	
					NEC X	98.50 27	13	12	1	56	.	56	3	41	
					NERM X	29.40 27	.	.	.	.	.	.	.	.
					NERH X	73.20 27	.	.	.	.	.	.	.	.
105 SAND		HA28	BT	%	ERL X	15.60 27	24	12	44	54	37	18	40	5	
					ERM X	32.95 27	24	12	36	47	26	21	37	16	
					TEL X	21.42 27	24	12	39	46	28	18	40	14	
					PEL X	48.09 27	24	12	30	51	23	28	30	19	
					NEC X	98.50 27	24	12	1	56	.	56	2	42	
					NERM X	29.40 27	.	.	.	.	.	.	.	.
					NERH X	70.20 27	.	.	.	.	.	.	.	.
106 WATER	CR14	BT	%		ERL X	44.10 27	11	8	22	60	19	40	33	7	
					ERM X	46.30 27	11	8	18	55	12	43	31	14	

APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NORTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
106	WATER	CR14	BT	%	TEL	X	42.88	27	11	8	23	57	19	38	36	7
					PEL	X	54.44	27	11	8	10	60	5	55	19	21
					NEC	G	76.40	27	11	8	1	71	.	71	2	26
					NERM	X	41.70	27	.	.	.	.	.	.	.	.
					NERH	X	64.00	27	.	.	.	.	.	.	.	.
106	WATER	HA14	BT	%	ERL	X	41.70	27	13	10	18	59	28	31	28	13
					ERM	X	46.30	27	13	10	13	50	16	34	25	25
					TEL	X	40.84	27	13	10	18	59	28	31	28	13
					PEL	X	54.44	27	13	10	8	53	9	44	16	31
					NEC	X	76.40	27	13	10	1	56	.	56	3	41
106	WATER	HA28	BT	%	NERM	X	40.00	27	.	.	.	.	.	.	.	.
					NERH	X	64.00	27	.	.	.	.	.	.	.	.
					ERL	X	44.10	27	24	8	29	53	23	30	28	19
					ERM	X	48.60	27	24	8	22	54	18	37	21	25
					TEL	X	42.88	27	24	8	31	49	23	26	32	19
107	SILT	CR14	BT	%	PEL	X	54.58	27	24	8	14	54	11	44	14	32
	SILT	HA14	BT	%	NEC	X	76.40	27	24	8	2	54	.	54	4	42
107	SILT	HA28	BT	%	NERM	X	41.70	27	.	.	.	.	.	.	.	.
	SILT	HA28	BT	%	NERH	X	61.30	27	.	.	.	.	.	.	.	.
110	NH3P	CR14	BT	MG/L	NR	X	.	21	3	.	.	.	.	.	.	.
	NH3P	HA14	BT	MG/L	ERL	X	0.02	21	9	7	12	67	33	33	24	10
110	NH3P	HA14	BT	MG/L	ERM	X	0.27	21	9	7	4	76	19	57	.	24
	NH3P	HA14	BT	MG/L	TEL	X	0.01	21	9	7	12	67	33	33	24	10
	NH3P	HA14	BT	MG/L	PEL	X	0.10	21	9	7	4	76	19	57	.	24
	NH3P	HA14	BT	MG/L	NEC	X	0.09	21	9	7	5	71	19	52	5	24
	NH3P	HA14	BT	MG/L	NERM	X	0.01	21	.	.	.	.	.	.	.	.
110	NH3P	HA14	BT	MG/L	NERH	X	0.04	21	.	.	.	.	.	.	.	.
	NH3P	HA28	BT	MG/L	ERL	X	0.02	21	20	8	24	71	39	32	20	10
	NH3P	HA28	BT	MG/L	ERM	X	0.17	21	20	8	6	66	15	51	.	34
	NH3P	HA28	BT	MG/L	TEL	X	0.01	21	20	8	25	68	39	29	22	10
	NH3P	HA28	BT	MG/L	PEL	X	0.07	21	20	8	11	63	20	44	7	29
111	HSP	CR14	BT	MG/L	NEC	X	0.09	21	20	8	9	63	17	46	5	32
	HSP	CR14	BT	MG/L	NERM	X	0.01	21	.	.	.	.	.	.	.	.
111	HSP	HA14	BT	MG/L	NERH	X	0.03	21	.	.	.	.	.	.	.	.
	HSP	HA28	BT	MG/L	NR	X	.	2	.	.	.	.	.	.	.	.
300	AL	CR14	BS	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
	AL	CR14	BT	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
300	AL	HA14	BS	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
	AL	HA14	BT	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
300	AL	HA28	BS	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
	AL	HA28	BT	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
301	SILVER	CR14	BT	NG/G	NR	X	.	19	2	.	.	.	.	.	.	.
	SILVER	CR14	PW	UG/L	NR	X	.	16	.	.	.	.	.	.	.	.
301	SILVER	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
	SILVER	HA14	PW	UG/L	NR	X	.	16	.	.	.	.	.	.	.	.
301	SILVER	HA14	BT	NG/G	NR	X	.	19	2	.	.	.	.	.	.	.
	SILVER	HA28	BT	NG/G	NR	X	.	16	.	.	.	.	.	.	.	.
301	SILVER	HA28	PW	UG/L	NR	X	.	16	.	.	.	.	.	.	.	.
	SILVER	HA28	PW	UG/L	NR	X	.	16	.	.	.	.	.	.	.	.
302	ARSENIC	CR14	BS	NG/G	NR	X	.	4	.	.	.	.	.	.	.	.
	ARSENIC	CR14	BT	NG/G	ERL	X	32000.00	27	11	5	20	60	17	43	31	10
	ARSENIC	CR14	BT	NG/G	ERM	X	60000.00	27	11	5	7	71	7	64	10	19

APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
 SEC IN THRESGL USING GL DATA

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NUMCODE	CHEM CODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	N	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT
									TOX	EFFECT	HIT	CORRECT				
302 ARSENIC		CR14	BT	NG/G	TEL X	20435.26	27	11	5	22	55	17	38	36	10	
					PEL X	53216.54	27	11	5	9	71	10	62	12	17	
					NEC X	92900.00	27	11	5	4	69	2	67	7	24	
					NERM X	13050.00	27									
					NERH X	47200.00	27									
302 ARSENIC		CR14	PW	UG/L	NR X		20	3								
302 ARSENIC		HA14	BS	NG/G	NR X		4									
302 ARSENIC		HA14	BT	NG/G	ERL X	12100.00	27	13	10	19	69	34	34	25	6	
					ERM X	33000.00	27	13	10	10	66	19	47	13	22	
					TEL X	13200.00	27	13	10	15	63	25	38	22	16	
					PEL X	39466.44	27	13	10	9	63	16	47	13	25	
					NEC X	92900.00	27	13	10	2	59	3	56	3	38	
302 ARSENIC		HA14	PW	UG/L	NERM X	14400.00	27									
					NERH X	47200.00	27									
					ERL X	1.70	20	10	7	8	71	29	43	10	19	
					ERM X	2.30	20	10	7	5	67	19	48	5	29	
					TEL X	1.37	20	10	7	10	62	29	33	19	19	
302 ARSENIC		HA28	BS	NG/G	PEL X	1.98	20	10	7	5	67	19	48	5	29	
					NEC X	2.30	20	10	7	5	67	19	48	5	29	
					NERM X	1.10	20									
					NERH X	1.70	20									
					NR X		4									
302 ARSENIC		HA28	BS	NG/G												
302 ARSENIC		HA28	BT	NG/G	ERL X	13000.00	27	24	9	28	65	33	33	21	13	
					ERM X	34000.00	27	24	9	19	63	23	40	13	23	
					TEL X	13124.40	27	24	9	26	62	29	33	21	17	
					PEL X	40059.96	27	24	9	17	60	19	40	13	27	
					NEC X	92900.00	27	24	9	4	54	4	50	4	42	
302 ARSENIC		HA28	PW	UG/L	NERM X	13250.00	27									
					NERH X	47200.00	27									
					ERL X	1.70	20	19	8	22	69	42	28	19	11	
					ERM X	2.00	20	19	8	19	61	33	28	19	19	
					TEL X	1.37	20	19	8	24	64	42	22	25	11	
303 CADMIUM		CR14	BS	NG/G	PEL X	1.79	20	19	8	19	61	33	28	19	19	
					NEC X	2.30	20	19	8	19	61	33	28	19	19	
					NERM X	1.10	20									
					NERH X	1.60	20									
					ERL X	787.00	22	9	5	17	62	16	46	30	8	
303 CADMIUM		CR14	BT	NG/G	ERM X	1349.00	22	9	5	15	62	14	49	27	11	
					TEL X	420.80	22	9	5	21	57	19	38	38	5	
					PEL X	870.71	22	9	5	16	59	14	46	30	11	
					NEC X	1349.00	22	9	5	15	62	14	49	27	11	
					NERM X	225.00	22									
303 CADMIUM		CR14	PW	UG/L	NERH X	562.00	22									
					ERL X	5200.00	27	11	6	10	83	17	67	7	10	
					ERM X	10850.00	27	11	6	5	81	10	71	2	17	
					TEL X	2026.82	27	11	6	20	64	19	45	29	7	
					PEL X	5208.17	27	11	6	9	81	14	67	7	12	
303 CADMIUM		CR14	BT	NG/G	NEC X	8000.00	27	11	6	8	83	14	69	5	12	
					NERM X	790.00	27									
					NERH X	2500.00	27									
					ERL X	0.19	20	9	5	15	66	17	49	26	9	
					ERM X	1.00	20	9	5	6	80	11	69	6	14	
303 CADMIUM		CR14	PW	UG/L	TEL X	0.12	20	9	5	16	63	17	46	29	9	
					PEL X	0.45	20	9	5	7	83	14	69	6	11	
					NEC X	0.20	20	9	5	14	63	14	49	26	11	
					NERM X	0.08	20									
					NERH X	0.20	20									
303 CADMIUM		HA14	BS	NG/G	ERL X	337.00	22	11	10	12	78	39	39	13	9	
					ERM X	1068.00	22	11	10	5	74	22	52		26	
					TEL X	237.23	22	11	10	12	78	39	39	13	9	
					PEL X	774.74	22	11	10	7	74	26	48	4	22	
					NEC X	899.00	22	11	10	6	70	22	48	4	26	
303 CADMIUM		HA14	BT	NG/G	NERM X	167.00	22									
					NERH X	562.00	22									
					ERL X	700.00	27	13	11	19	81	41	41	19		
					ERM X	5200.00	27	13	11	7	75	19	56	3	22	
303 CADMIUM		HA14	PW	UG/L	TEL X	674.54	27	13	11	19	81	41	41	19		
					PEL X	3605.55	27	13	11	8	78	22	56	3	19	

APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL						
											TOX	EFFECT	HIT	CORRECT	TOXHIT	NOTNOT	NOTHIT
303 CADMIUM		HA14	BT	NG/G	NEC		8000.00	27	13	11	6	72	16	56	3	25	.
					NERM X	X	650.00	27	.	.	.	.	.	.	.	.	.
					NERH X	X	2500.00	27	.	.	.	.	.	.	.	.	.
303 CADMIUM		HA14	PW	UG/L	ERL X	X	0.10	20	10	6	10	62	29	33	19	19	.
					ERM X	X	0.92	20	10	6	3	67	14	52	.	33	.
					TEL X	X	0.09	20	10	6	10	62	29	33	19	19	.
					PEL	X	0.43	20	10	6	4	71	19	52	.	29	.
					NEC X	X	0.20	20	10	6	8	52	19	33	19	29	.
					NERM X	X	0.08	20	.	.	.	.	.	.	.	.	.
					NERH X	X	0.20	20	.	.	.	.	.	.	.	.	.
303 CADMIUM		HA28	BS	NG/G	ERL		337.00	22	19	10	23	74	42	32	18	8	.
					ERM		1068.00	22	19	10	15	74	32	42	8	18	.
					TEL		237.23	22	19	10	23	74	42	32	18	8	.
					PEL		774.74	22	19	10	17	74	34	39	11	16	.
					NEC		899.00	22	19	10	16	71	32	39	11	18	.
					NERM X	X	167.00	22	.	.	.	.	.	.	.	.	.
					NERH X	X	562.00	22	.	.	.	.	.	.	.	.	.
303 CADMIUM		HA28	BT	NG/G	ERL X	X	900.00	27	24	11	31	69	29	40	21	10	.
					ERM		5200.00	27	24	11	10	71	13	58	3	26	.
					TEL X	X	737.90	27	24	11	33	66	29	37	24	10	.
					PEL	X	3605.55	27	24	11	14	74	18	56	5	21	.
					NEC		8000.00	27	24	11	8	71	11	60	2	27	.
					NERM X	X	605.00	27	.	.	.	.	.	.	.	.	.
					NERH X	X	2500.00	27	.	.	.	.	.	.	.	.	.
303 CADMIUM		HA28	PW	UG/L	ERL X	X	0.10	20	19	6	18	64	33	31	17	19	.
					ERM X	X	0.92	20	19	6	6	64	17	47	.	36	.
					TEL X	X	0.09	20	19	6	18	64	33	31	17	19	.
					PEL X	X	0.43	20	19	6	7	67	19	47	.	33	.
					NEC X	X	0.20	20	19	6	14	53	22	31	17	31	.
					NERM X	X	0.08	20	.	.	.	.	.	.	.	.	.
					NERH X	X	0.20	20	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T CR14		BS	NG/G		ERL		21682.00	22	9	5	5	89	14	76	.	11	.
					ERM		41077.00	22	9	5	3	84	8	76	.	16	.
					TEL		5414.25	22	9	5	7	84	14	70	5	11	.
					PEL		9471.65	22	9	5	6	86	14	73	3	11	.
					NEC		14975.00	22	9	5	6	86	14	73	3	11	.
					NERM X		1352.00	22	.	.	.	.	.	.	.	.	.
					NERH X		2184.00	22	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T CR14		BT	NG/G		ERL		274000.00	27	11	7	7	86	14	71	2	12	.
					ERM		407000.00	27	11	7	4	83	10	74	.	17	.
					TEL		119364.99	27	11	7	7	86	14	71	2	12	.
					PEL		195075.63	27	11	7	7	86	14	71	2	12	.
					NEC		312000.00	27	11	7	6	83	12	71	2	14	.
					NERM X		52000.00	27	.	.	.	.	.	.	.	.	.
					NERH X		93500.00	27	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T CR14		PW	UG/L		ERL		2.46	20	9	5	7	83	14	69	6	11	.
					ERM		24.40	20	9	5	3	83	9	74	.	17	.
					TEL		1.28	20	9	5	8	80	14	66	9	11	.
					PEL		6.81	20	9	5	4	86	11	74	.	14	.
					NEC		2.50	20	9	5	6	80	11	69	6	14	.
					NERM X		0.67	20	.	.	.	.	.	.	.	.	.
					NERH X		1.90	20	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T HA14		BS	NG/G		ERL		14975.00	22	11	7	6	78	26	52	.	22	.
					ERM X	X	22254.00	22	11	7	4	70	17	52	.	30	.
					TEL		4499.58	22	11	7	6	78	26	52	.	22	.
					PEL		6059.63	22	11	7	6	78	26	52	.	22	.
					NEC		2184.00	22	11	7	8	78	30	48	4	17	.
					NERM X		1352.00	22	.	.	.	.	.	.	.	.	.
					NERH X		1650.00	22	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T HA14		BT	NG/G		ERL		56000.00	27	13	12	15	81	34	47	13	6	.
					ERM		293000.00	27	13	12	6	78	19	59	.	22	.
					TEL		53962.95	27	13	12	15	81	34	47	13	6	.
					PEL		131480.04	27	13	12	7	81	22	59	.	19	.
					NEC		95000.00	27	13	12	9	81	25	56	3	16	.
					NERM X		52000.00	27	.	.	.	.	.	.	.	.	.
					NERH X		59000.00	27	.	.	.	.	.	.	.	.	.
304 CHROMIUM-T HA14		PW	UG/L		ERL		2.46	20	10	7	7	76	29	48	5	19	.
					ERM		13.20	20	10	7	4	71	19	52	.	29	.
					TEL		1.28	20	10	7	8	71	29	43	10	19	.
					PEL		5.01	20	10	7	4	71	19	52	.	29	.

APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA

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**APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA**

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**APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA**

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APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA

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NUMCODE	CHEM CODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	CORRECT	TOXHIT	NOTNOT	NOTHIT	TOXNOT
								N	TOX	EFFECT	HIT					
310 LEAD		HA14	BT	NG/G	ERL		51000.00	27	13	11	14	78	31	47	13	9
					ERM		251000.00	27	13	11	6	78	19	59	.	22
					TEL		39825.87	27	13	11	15	81	34	47	13	6
					PEL		120656.54	27	13	11	6	78	19	59	.	22
					NEC		68700.00	27	13	11	10	84	28	56	3	13
					NERM X		31100.00	27	.	.	.	.	.	.	.	.
					NERH X		58000.00	27	.	.	.	.	.	.	.	.
310 LEAD		HA14	PW	UG/L	ERL		0.70	20	10	10	16	71	48	24	29	.
					ERM		5.50	20	10	10	5	76	24	52	.	24
					TEL X		0.73	20	10	10	13	67	38	29	24	10
					PEL		4.39	20	10	10	6	81	29	52	.	19
					NEC		4.10	20	10	10	7	76	29	48	5	19
					NERM X		0.76	20	.	.	.	.	.	.	.	.
					NERH X		3.50	20	.	.	.	.	.	.	.	.
310 LEAD		HA28	BS	NG/G	ERL		13882.00	22	19	6	17	74	34	39	11	16
					ERM X		81115.00	22	19	6	4	61	11	50	.	39
					TEL X		10658.81	22	19	6	24	55	34	21	29	16
					PEL		30806.58	22	19	6	15	74	32	42	8	18
					NEC X		11700.00	22	19	6	24	55	34	21	29	16
					NERM X		8184.00	22	.	.	.	.	.	.	.	.
					NERH X		11700.00	22	.	.	.	.	.	.	.	.
310 LEAD		HA28	BT	NG/G	ERL		55000.00	27	24	11	26	74	27	47	15	11
					ERM		251000.00	27	24	11	7	73	11	61	.	27
					TEL		41358.19	27	24	11	28	74	29	45	16	10
					PEL		120656.54	27	24	11	8	71	11	60	2	27
					NEC		68700.00	27	24	11	21	76	24	52	10	15
					NERM X		31100.00	27	.	.	.	.	.	.	.	.
					NERH X		58000.00	27	.	.	.	.	.	.	.	.
310 LEAD		HA28	PW	UG/L	ERL X		0.70	20	19	11	19	67	36	31	17	17
					ERM X		5.30	20	19	11	6	64	17	47	.	36
					TEL X		0.70	20	19	11	19	67	36	31	17	17
					PEL X		4.31	20	19	11	6	64	17	47	.	36
					NEC X		4.10	20	19	11	7	61	17	44	3	36
					NERM X		0.70	20	.	.	.	.	.	.	.	.
					NERH X		3.50	20	.	.	.	.	.	.	.	.
311 SELENIUM	CR14	BT	NG/G		NR X		.	19	.	.	.	.	.	.	.	.
311 SELENIUM	HA14	BT	NG/G		NR X		.	19	.	.	.	.	.	.	.	.
311 SELENIUM	HA28	BT	NG/G		NR X		.	19	2	.	.	.	.	.	.	.
312 ZINC	CR14	BS	NG/G		ERL X		12747.00	22	9	5	26	38	16	22	54	8
					ERM X		102239.00	22	9	5	14	59	11	49	27	14
					TEL X		11901.99	22	9	5	27	35	16	19	57	8
					PEL X		37833.13	22	9	5	15	62	14	49	27	11
					NEC X		27390.00	22	9	5	16	59	14	46	30	11
					NERM X		11113.00	22	.	.	.	.	.	.	.	.
					NERH X		14000.00	22	.	.	.	.	.	.	.	.
312 ZINC	CR14	BT	NG/G		ERL X		381000.00	27	11	7	18	64	17	48	26	10
					ERM		2250000.00	27	11	7	6	83	12	71	2	14
					TEL X		248822.23	27	11	7	23	57	19	38	36	7
					PEL		899374.78	27	11	7	10	74	12	62	12	14
					NEC		900000.00	27	11	7	10	74	12	62	12	14
					NERM X		162500.00	27	.	.	.	.	.	.	.	.
					NERH X		359500.00	27	.	.	.	.	.	.	.	.
312 ZINC	CR14	PW	UG/L		ERL X		6.30	20	9	5	19	54	17	37	37	9
					ERM		49.60	20	9	5	9	71	11	60	14	14
					TEL X		2.86	20	9	5	24	40	17	23	51	9
					PEL X		13.91	20	9	5	14	63	14	49	26	11
					NEC X		10.70	20	9	5	15	60	14	46	29	11
					NERM X		1.30	20	.	.	.	.	.	.	.	.
					NERH X		3.90	20	.	.	.	.	.	.	.	.
312 ZINC	HA14	BS	NG/G		ERL X		12747.00	22	11	6	12	52	26	26	26	22
					ERM X		84066.00	22	11	6	3	65	13	52	.	35
					TEL X		10762.23	22	11	6	15	39	26	13	39	22
					PEL X		34306.33	22	11	6	4	70	17	52	.	30
					NEC X		17388.00	22	11	6	6	70	22	48	4	26
					NERM X		9086.50	22	.	.	.	.	.	.	.	.
					NERH X		14000.00	22	.	.	.	.	.	.	.	.
312 ZINC	HA14	BT	NG/G		ERL		159000.00	27	13	12	17	81	38	44	16	3
					ERM		422000.00	27	13	12	7	75	19	56	3	22

APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THREESGL USING GL DATA

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**APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THREESGL USING GL DATA**

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	N	#	TOX	#	EFFECT	#	HIT	#	CORRECT	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT
403	13-2CLBNZ	CR14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
403	13-2CLBNZ	HA14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
403	13-2CLBNZ	HA28	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.	.	.	.	.	.	.	.
404	NAPHTHALENE	CR14	BT	NG/G	ERL		160.00	27	11	7	15	71	17	55	19	19	10					
					ERM		3600.00	27	11	7	5	81	10	71	2	17						
					TEL		126.17	27	11	7	16	74	19	55	19	7						
					PEL		1003.99	27	11	7	5	81	10	71	2	17						
					NEC	@	20000.00	27	11	7	1	71	.	71	2	26						
					NERM	X	99.50	27	.	.	.	.	.	.	.	.
					NERH	X	280.00	27	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA14	BT	NG/G	ERL		55.00	27	13	12	18	78	38	41	19	3						
					ERM		325.00	27	13	12	6	78	19	59	.	22						
					TEL		43.87	27	13	12	18	78	38	41	19	3						
					PEL		285.04	27	13	12	7	75	19	56	3	22						
					NEC		290.00	27	13	12	7	75	19	56	3	22						
					NERM	X	35.00	27	.	.	.	.	.	.	.	.
					NERH	X	250.00	27	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA28	BT	NG/G	ERL	X	42.00	27	24	12	22	61	18	44	18	21						
					ERM	X	325.00	27	24	12	7	69	10	60	2	29						
					TEL	X	49.78	27	24	12	21	60	16	44	18	23						
					PEL	X	285.04	27	24	12	8	68	10	58	3	29						
					NEC	X	290.00	27	24	12	8	68	10	58	3	29						
					NERM	X	59.00	27	.	.	.	.	.	.	.	.
					NERH	X	250.00	27	.	.	.	.	.	.	.	.
405	2-METHNAP	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.	.	.	.	.	.	.
405	2-METHNAP	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.	.	.	.	.	.	.
405	2-METHNAP	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.	.	.	.	.	.	.	.
406	ACENA	CR14	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.	.	.	.	.	.	.
406	ACENA	HA14	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.	.	.	.	.	.	.
406	ACENA	HA28	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.	.	.	.	.	.	.
407	DIBNZFURAN	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.	.	.	.	.	.	.
407	DIBNZFURAN	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.	.	.	.	.	.	.
407	DIBNZFURAN	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.	.	.	.	.	.	.	.
408	FLUORENE	CR14	BT	NG/G	ERL		88.00	27	11	7	16	74	19	55	19	7						
					ERM		1700.00	27	11	7	5	81	10	71	2	17						
					TEL		91.43	27	11	7	15	71	17	55	19	10						
					PEL		689.93	27	11	7	6	83	12	71	2	14						
					NEC		1800.00	27	11	7	4	79	7	71	2	19						
					NERM	X	95.00	27	.	.	.	.	.	.	.	.
					NERH	X	280.00	27	.	.	.	.	.	.	.	.
408	FLUORENE	HA14	BT	NG/G	ERL		50.00	27	13	12	19	75	38	38	22	3						
					ERM		595.00	27	13	12	6	78	19	59	.	22						
					TEL		43.59	27	13	12	20	78	41	38	22							
					PEL		385.68	27	13	12	7	81	22	59	.	19						
					NEC		290.00	27	13	12	8	78	22	56	3	19						
					NERM	X	38.00	27	.	.	.	.	.	.	.	.
					NERH	X	250.00	27	.	.	.	.	.	.	.	.
408	FLUORENE	HA28	BT	NG/G	ERL	X	46.00	27	24	12	24	58	18	40	21	21						
					ERM	X	595.00	27	24	12	7	69	10	60	2	29						
					TEL	X	47.96	27	24	12	23	56	16	40	21	23						
					PEL		385.68	27	24	12	8	71	11	60	2	27						
					NEC	X	290.00	27	24	12	9	69	11	58	3	27						
					NERM	X	50.00	27	.	.	.	.	.	.	.	.
					NERH	X	250.00	27	.	.	.	.	.	.	.	.
409	PHENANTHRN	CR14	BT	NG/G	ERL		390.00	27	11	7	16	79	21	57	17	5						
					ERM		3400.00	27	11	7	5	81	10	71	2	17						
					TEL		394.97	27	11	7	15	76	19	57	17	7						
					PEL		1709.97	27	11	7	5	81	10	71	2	17						
					NEC		6100.00	27	11	7	4	79	7	71	2	19						
					NERM	X	400.00	27	.	.	.	.	.	.	.	.
					NERH	X	860.00	27	.	.	.	.	.	.	.	.

APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THREESGL USING GL DATA

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APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
 SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NOTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
412	PYRENE	HA28	BT	NG/G	ERL	X	120.00	27	24	13	30	58	23	35	26	16
					ERM	X	1100.00	27	24	13	9	69	11	58	3	27
					TEL	X	150.62	27	24	13	25	56	18	39	23	21
					PEL	X	983.87	27	24	13	10	68	11	56	5	27
					NEC	X	1800.00	27	24	13	8	68	10	58	3	29
					NERM	X	215.00	27	.	.	.	.	.	.	.	.
					NERH	X	880.00	27	.	.	.	.	.	.	.	.
413	BAA	CR14	BT	NG/G	ERL		300.00	27	11	7	13	81	19	62	12	7
					ERM		4200.00	27	11	7	4	83	10	74	.	17
					TEL		273.86	27	11	7	13	81	19	62	12	7
					PEL		1554.03	27	11	7	5	81	10	71	2	17
					NEC		3500.00	27	11	7	5	81	10	71	2	17
					NERM	X	250.00	27	.	.	.	.	.	.	.	.
					NERH	X	575.00	27	.	.	.	.	.	.	.	.
413	BAA	HA14	BT	NG/G	ERL		260.00	27	13	13	15	88	38	50	9	.3
					ERM		490.00	27	13	13	8	78	22	56	3	19
					TEL		161.65	27	13	13	18	78	38	41	19	3
					PEL		363.73	27	13	13	10	78	25	53	6	16
					NEC		690.00	27	13	13	6	72	16	56	3	25
					NERM	X	100.50	27	.	.	.	.	.	.	.	.
					NERH	X	270.00	27	.	.	.	.	.	.	.	.
413	BAA	HA28	BT	NG/G	ERL	X	35.00	27	24	13	33	56	24	32	29	15
					ERM	X	490.00	27	24	13	9	69	11	58	3	27
					TEL	X	84.71	27	24	13	28	58	21	37	24	18
					PEL	X	408.17	27	24	13	11	69	13	56	5	26
					NEC	X	690.00	27	24	13	7	66	8	58	3	31
					NERM	X	205.00	27	.	.	.	.	.	.	.	.
					NERH	X	340.00	27	.	.	.	.	.	.	.	.
414	CHRYSENE	CR14	BT	NG/G	ERL		500.00	27	11	7	10	88	19	69	5	7
					ERM		5200.00	27	11	7	4	83	10	74	.	17
					TEL		367.42	27	11	7	14	83	21	62	12	5
					PEL		1831.39	27	11	7	5	81	10	71	2	17
					NEC		4000.00	27	11	7	5	81	10	71	2	17
					NERM	X	270.00	27	.	.	.	.	.	.	.	.
					NERH	X	645.00	27	.	.	.	.	.	.	.	.
414	CHRYSENE	HA14	BT	NG/G	ERL		330.00	27	13	13	16	84	38	47	13	3
					ERM		690.00	27	13	13	7	81	22	59	.	19
					TEL		188.79	27	13	13	20	72	38	34	25	3
					PEL		525.36	27	13	13	9	81	25	56	3	16
					NEC		600.00	27	13	13	9	81	25	56	3	16
					NERM	X	108.00	27	.	.	.	.	.	.	.	.
					NERH	X	400.00	27	.	.	.	.	.	.	.	.
414	CHRYSENE	HA28	BT	NG/G	ERL	X	110.00	27	24	13	28	61	23	39	23	16
					ERM	X	690.00	27	24	13	8	71	11	60	2	27
					TEL	X	150.17	27	24	13	25	56	18	39	23	21
					PEL	X	551.00	27	24	13	10	71	13	58	3	26
					NEC		600.00	27	24	13	10	71	13	58	3	26
					NERM	X	205.00	27	.	.	.	.	.	.	.	.
					NERH	X	440.00	27	.	.	.	.	.	.	.	.
415	BBF	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
415	BBF	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
415	BBF	HA28	BT	NG/G	NR	X	.	19	4	.	.	.	.	.	.	.
416	BKF	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
416	BKF	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
416	BKF	HA28	BT	NG/G	NR	X	.	19	4	.	.	.	.	.	.	.
417	BAP	CR14	BT	NG/G	ERL		210.00	27	11	6	18	74	21	52	21	5
					ERM		8500.00	27	11	6	3	81	7	74	.	19
					TEL		219.77	27	11	6	17	71	19	52	21	7
					PEL		1933.91	27	11	6	5	81	10	71	2	17
					NEC		5800.00	27	11	6	5	81	10	71	2	17
					NERM	X	230.00	27	.	.	.	.	.	.	.	.
					NERH	X	440.00	27	.	.	.	.	.	.	.	.
417	BAP	HA14	BT	NG/G	ERL		350.00	27	13	11	11	88	31	56	3	9
					ERM		620.00	27	13	11	6	78	19	59	.	22
					TEL		187.55	27	13	11	18	78	38	41	19	3
					PEL		409.15	27	13	11	10	84	28	56	3	13

**APPENDIX 3B: SUMMARY OF SECs NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA**

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APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
 SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NORTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
423	4-METHNAP	HA14	BT	NG/G	NR	X		7	.	.	.	.	.	.	.
423	4-METHNAP	HA28	BT	NG/G	NR	X		7	.	.	.	.	.	.	.
450	PAH-T	CR14	BT	NG/G	ERL		3553.00	27	11	7	17	76	21	55	19	5
					ERM		59140.00	27	11	7	5	81	10	71	2	17
					TEL		4081.02	27	11	7	16	74	19	55	19	7
					PEL		21911.15	27	11	7	5	81	10	71	2	17
					NEC		84600.00	27	11	7	4	79	7	71	2	19
					NERM	X	4687.50	27	.	.	.	.	.	.	.	.
					NERH	X	8118.00	27	.	.	.	.	.	.	.	.
450	PAH-T	HA14	BT	NG/G	ERL		3553.00	27	13	13	18	78	38	41	19	3
					ERM		8498.00	27	13	13	8	78	22	56	3	19
					TEL		2468.84	27	13	13	20	72	38	34	25	3
					PEL		6736.42	27	13	13	9	81	25	56	3	16
					NEC		9240.00	27	13	13	7	75	19	56	3	22
					NERM	X	1715.50	27	.	.	.	.	.	.	.	.
					NERH	X	5340.00	27	.	.	.	.	.	.	.	.
450	PAH-T	HA28	BT	NG/G	ERL	X	1297.00	27	24	13	27	56	19	37	24	19
					ERM	X	8498.00	27	24	13	9	69	11	58	3	27
					TEL	X	2145.02	27	24	13	24	58	18	40	21	21
					PEL		6786.69	27	24	13	10	71	13	58	3	26
					NEC	X	9240.00	27	24	13	8	68	10	58	3	29
					NERM	X	3547.50	27	.	.	.	.	.	.	.	.
					NERH	X	5420.00	27	.	.	.	.	.	.	.	.
451	PAH-L	CR14	BT	NG/G	ERL		811.00	27	11	7	17	71	19	52	21	7
					ERM		11040.00	27	11	7	5	81	10	71	2	17
					TEL		922.36	27	11	7	15	71	17	55	19	10
					PEL		5658.27	27	11	7	5	81	10	71	2	17
					NEC		33600.00	27	11	7	3	76	5	71	2	21
					NERM	X	1049.00	27	.	.	.	.	.	.	.	.
					NERH	X	2900.00	27	.	.	.	.	.	.	.	.
451	PAH-L	HA14	BT	NG/G	ERL		786.00	27	13	13	18	78	38	41	19	3
					ERM		3369.00	27	13	13	7	81	22	59	.	19
					TEL		534.52	27	13	13	21	75	41	34	25	.
					PEL		2919.52	27	13	13	8	78	22	56	3	19
					NEC		3040.00	27	13	13	8	78	22	56	3	19
					NERM	X	363.50	27	.	.	.	.	.	.	.	.
					NERH	X	2530.00	27	.	.	.	.	.	.	.	.
451	PAH-L	HA28	BT	NG/G	ERL	X	536.00	27	24	13	23	63	19	44	18	19
					ERM		3369.00	27	24	13	8	71	11	60	2	27
					TEL	X	744.10	27	24	13	19	63	16	47	15	23
					PEL	X	2919.52	27	24	13	9	69	11	58	3	27
					NEC	X	3040.00	27	24	13	9	69	11	58	3	27
					NERM	X	1033.00	27	.	.	.	.	.	.	.	.
					NERH	X	2530.00	27	.	.	.	.	.	.	.	.
452	PAH-H	CR14	BT	NG/G	ERL		2900.00	27	11	7	15	81	21	60	14	5
					ERM		48100.00	27	11	7	5	81	10	71	2	17
					TEL		2813.72	27	11	7	16	79	21	57	17	5
					PEL		16881.72	27	11	7	5	81	10	71	2	17
					NEC		51000.00	27	11	7	4	79	7	71	2	19
					NERM	X	2730.00	27	.	.	.	.	.	.	.	.
					NERH	X	5925.00	27	.	.	.	.	.	.	.	.
452	PAH-H	HA14	BT	NG/G	ERL		2900.00	27	13	13	16	84	38	47	13	3
					ERM		5650.00	27	13	13	8	78	22	56	3	19
					TEL		1685.82	27	13	13	20	72	38	34	25	3
					PEL		4089.50	27	13	13	10	84	28	56	3	13
					NEC		6200.00	27	13	13	7	75	19	56	3	22
					NERM	X	980.00	27	.	.	.	.	.	.	.	.
					NERH	X	2960.00	27	.	.	.	.	.	.	.	.
452	PAH-H	HA28	BT	NG/G	ERL	X	486.00	27	24	13	32	55	23	32	29	16
					ERM	X	5650.00	27	24	13	9	69	11	58	3	27
					TEL	X	969.75	27	24	13	26	55	18	37	24	21
					PEL		4503.09	27	24	13	11	73	15	58	3	24
					NEC	X	6200.00	27	24	13	8	68	10	58	3	29
					NERM	X	1935.00	27	.	.	.	.	.	.	.	.
					NERH	X	3589.00	27	.	.	.	.	.	.	.	.
508	PCB-T	CR14	BT	NG/G	NR	X		8	2	.	.	.	.	.	.	.
508	PCB-T	HA14	BT	NG/G	NR	X		8	2	.	.	.	.	.	.	.

APPENDIX 3B: SUMMARY OF SEC'S NORMALIZED TO DRY WEIGHT
SEC IN THRESGL USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL				
								N	TOX	EFFECT	HIT	CORRECT	TOXHIT	NOTNOT	NOTHIT
508	PCB-T	HA28	BT	NG/G	NR	X		8	2

Appendix 3c Summary of sediment effect concentrations (SECs) calculated using sediment concentrations normalized to total organic carbon (TOC) concentrations and listed by chemical, test type, and sample type for the entire database. See legend to Appendix 3a for a description of the headings.

**APPENDIX 3C: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA**

1

**APPENDIX 3C: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA**

2

APPENDIX 3C: SUMMARY OF SEC'S NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA

3

APPENDIX 3C: SUMMARY OF SEC'S NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA

4

NUMCODE	CHEM CODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL				
								TOX	EFFECT	HIT	CORRECT	TOXHIT	NOTNOT	NOTHIT	TOXNOT
416	BKF	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.
416	BKF	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.
416	BKF	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.
417	BAP	CR14	BT	NG/G	ERL		12432.43	42	11	7	14	79	19	60	14
					ERM		125000.00	42	11	7	4	83	10	74	17
					TEL	X	3525.97	42	11	7	20	69	21	48	26
					PEL		50000.00	42	11	7	6	79	10	69	5
					NEC		80000.00	42	11	7	5	81	10	71	2
					NERM	X	1000.00	42	.	.	.	.	.	.	17
					NERH	X	20000.00	42	.	.	.	.	.	.	.
417	BAP	HA14	BT	NG/G	ERL		12432.43	32	13	11	16	78	34	44	16
					ERM		36470.59	32	13	11	7	75	19	56	3
					TEL		7725.00	32	13	11	20	72	38	34	25
					PEL	X	26483.15	32	13	11	9	69	19	50	9
					NEC	X	80000.00	32	13	11	5	69	13	56	3
					NERM	X	4800.00	32	.	.	.	.	.	.	22
					NERH	X	19230.77	32	.	.	.	.	.	.	.
417	BAP	HA28	BT	NG/G	ERL	X	1217.39	62	24	18	37	53	26	27	34
					ERM	X	11216.22	62	24	18	16	65	15	50	11
					TEL	X	1158.75	62	24	18	38	52	26	35	13
					PEL	X	13185.27	62	24	18	15	63	13	50	11
					NEC	X	80000.00	62	24	18	5	66	6	60	2
					NERM	X	1102.94	62	.	.	.	.	.	.	32
					NERH	X	15500.00	62	.	.	.	.	.	.	.
418	ICDP	CR14	BT	NG/G	ERL		8108.11	42	11	7	13	76	17	60	14
					ERM		94642.86	42	11	7	4	83	10	74	17
					TEL		2847.47	42	11	7	19	71	21	50	24
					PEL		36770.11	42	11	7	6	79	10	69	5
					NEC		80000.00	42	11	7	5	81	10	71	2
					NERM	X	1000.00	42	.	.	.	.	.	.	17
					NERH	X	14285.71	42	.	.	.	.	.	.	.
418	ICDP	HA14	BT	NG/G	ERL		7619.05	32	13	11	17	75	34	41	19
					ERM	X	26000.00	32	13	11	10	66	19	47	13
					TEL	X	5039.53	32	13	11	20	66	34	31	28
					PEL	X	26495.28	32	13	11	9	63	16	47	13
					NEC	X	80000.00	32	13	11	5	69	13	56	3
					NERM	X	3333.33	32	.	.	.	.	.	.	28
					NERH	X	27000.00	32	.	.	.	.	.	.	.
418	ICDP	HA28	BT	NG/G	ERL	X	1000.00	57	21	16	41	44	26	18	46
					ERM	X	9054.05	57	21	16	14	67	14	53	11
					TEL	X	1000.00	57	21	16	41	44	26	18	46
					PEL	X	8801.28	57	21	16	14	67	14	53	11
					NEC	X	80000.00	57	21	16	5	68	7	61	2
					NERM	X	1000.00	57	.	.	.	.	.	.	30
					NERH	X	8555.56	57	.	.	.	.	.	.	.
419	BGHIP	CR14	BT	NG/G	ERL		13809.52	42	11	7	12	79	17	62	12
					ERM		112500.00	42	11	7	4	83	10	74	17
					TEL		4154.74	42	11	7	19	71	21	50	24
					PEL		40089.19	42	11	7	6	79	10	69	5
					NEC		80000.00	42	11	7	5	81	10	71	2
					NERM	X	1250.00	42	.	.	.	.	.	.	17
					NERH	X	14285.71	42	.	.	.	.	.	.	.
419	BGHIP	HA14	BT	NG/G	ERL		8108.11	32	13	11	17	75	34	41	19
					ERM	X	31000.00	32	13	11	9	69	19	50	9
					TEL	X	5198.75	32	13	11	21	69	38	31	28
					PEL	X	28930.95	32	13	11	9	69	19	50	9
					NEC	X	80000.00	32	13	11	5	69	13	56	3
					NERM	X	3333.33	32	.	.	.	.	.	.	28
					NERH	X	27000.00	32	.	.	.	.	.	.	.
419	BGHIP	HA28	BT	NG/G	ERL	X	1250.00	62	24	18	37	56	27	29	32
					ERM	X	10621.21	62	24	18	16	65	15	50	11
					TEL	X	1165.92	62	24	18	38	55	27	27	34
					PEL	X	11900.26	62	24	18	15	63	13	50	11
					NEC	X	80000.00	62	24	18	5	66	6	60	2
					NERM	X	1087.50	62	.	.	.	.	.	.	32
					NERH	X	13333.33	62	.	.	.	.	.	.	.
420	BBKF	CR14	BT	NG/G	NR	X	.	23	1	.	.	.	.	.	.

APPENDIX 3C: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA

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**APPENDIX 3C: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRESTOC USING ALL DATA**

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Appendix 3d Summary of sediment effect concentrations (SECs) calculated using sediment concentrations normalized to total organic carbon (TOC) concentrations and listed by chemical, test type, and sample type for the Great Lakes database. See legend to Appendix 3a for a description of the headings.

APPENDIX 3D: SUMMARY OF SEC'S NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRGLOTOC USING GL DATA

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NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#	#	#	TOTAL	TOXHIT	NOTNOT	NORTHIT	TOXNOT	
								N	TOX	EFFECT	HIT					
401	14-2CLBNZ	CR14	BT	NG/G	NR	X	.	19	2	.	.	.	.	.	.
401	14-2CLBNZ	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.
401	14-2CLBNZ	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.
402	12-2CLBNZ	CR14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
402	12-2CLBNZ	HA14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
402	12-2CLBNZ	HA28	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
403	13-2CLBNZ	CR14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
403	13-2CLBNZ	HA14	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
403	13-2CLBNZ	HA28	BT	NG/G	NR	X	.	7	.	.	.	.	.	.	.
404	NAPHTHALENE	CR14	BT	NG/G	ERL		3157.89	27	11	7	17	76	21	55	19	5
					ERM		56818.18	27	11	7	6	79	10	69	5	17
					TEL		4055.22	27	11	7	15	71	17	55	19	10
					PEL		37876.89	27	11	7	6	79	10	69	5	17
					NEC	G	224719.10	27	-11	7	1	71	.	71	2	26
					NERM	X	5207.52	27	.	.	.	.	.	.	.	.
					NERH	X	25250.00	27	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA14	BT	NG/G	ERL	X	2619.05	27	13	12	21	69	38	31	28	3
					ERM	X	15867.65	27	13	12	9	69	19	50	9	22
					TEL	X	2047.07	27	13	12	21	69	38	31	28	3
					PEL	X	17468.46	27	13	12	9	69	19	50	9	22
					NEC	X	80000.00	27	13	12	3	63	6	56	3	34
					NERM	X	1600.00	27	.	.	.	.	.	.	.	.
					NERH	X	19230.77	27	.	.	.	.	.	.	.	.
404	NAPHTHALENE	HA28	BT	NG/G	ERL	X	2619.05	27	24	11	24	61	19	42	19	19
					ERM	X	23500.00	27	24	11	8	68	10	58	3	29
					TEL	X	2654.21	27	24	11	23	60	18	42	19	21
					PEL	X	21258.48	27	24	11	8	68	10	58	3	29
					NEC	X	80000.00	27	24	11	3	63	3	60	2	35
					NERM	X	2689.84	27	.	.	.	.	.	.	.	.
					NERH	X	19230.77	27	.	.	.	.	.	.	.	.
405	2-METHNAP	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
405	2-METHNAP	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
405	2-METHNAP	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.	.
406	ACENA	CR14	BT	NG/G	NR	X	.	8	1	.	.	.	.	.	.	.
406	ACENA	HA14	BT	NG/G	NR	X	.	8	1	.	.	.	.	.	.	.
406	ACENA	HA28	BT	NG/G	NR	X	.	8	1	.	.	.	.	.	.	.
407	DIBNZFURAN	CR14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
407	DIBNZFURAN	HA14	BT	NG/G	NR	X	.	19	1	.	.	.	.	.	.	.
407	DIBNZFURAN	HA28	BT	NG/G	NR	X	.	19	3	.	.	.	.	.	.	.
408	FLUORENE	CR14	BT	NG/G	ERL		3285.71	27	11	9	16	74	19	55	19	7
					ERM		20000.00	27	11	9	8	79	12	67	7	14
					TEL		2875.24	27	11	9	17	76	21	55	19	5
					PEL		20112.05	27	11	9	7	76	10	67	7	17
					NEC		80000.00	27	11	9	2	74	2	71	2	24
					NERM	X	2516.04	27	.	.	.	.	.	.	.	.
					NERH	X	20224.72	27	.	.	.	.	.	.	.	.
408	FLUORENE	HA14	BT	NG/G	ERL	X	2090.91	27	13	12	21	69	38	31	28	3
					ERM	X	17053.57	27	13	12	9	69	19	50	9	22
					TEL	X	1627.42	27	13	12	22	66	38	28	31	3
					PEL	X	18109.48	27	13	12	9	69	19	50	9	22
					NEC	X	80000.00	27	13	12	2	59	3	56	3	38
					NERM	X	1266.67	27	.	.	.	.	.	.	.	.
					NERH	X	19230.77	27	.	.	.	.	.	.	.	.
408	FLUORENE	HA28	BT	NG/G	ERL	X	1543.86	27	24	12	28	55	19	35	26	19
					ERM	X	17053.57	27	24	12	10	65	10	55	6	29
					TEL	X	2130.91	27	24	12	23	56	16	40	21	23
					PEL	X	18109.48	27	24	12	10	65	10	55	6	29

APPENDIX 3D: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRLTOC USING GL DATA

2

NUMCODE	CHEM CODE	TEST	SAMPLE TYP	UNITS	SEC	C	CONC	#	#	#	TOTAL					
								N	TOX	EFFECT	HIT	CORRECT	TOXHIT	NOTNOT	NOTHIT	TOXNOT
408	FLUORENE	HA28	BT	NG/G	NEC	X	80000.00	27	24	12	2	61	2	60	2	37
					NERM	X	2941.18	27								
					NERH	X	19230.77	27								
409	PHENANTHRN	CR14	BT	NG/G	ERL		18571.43	27	11	9	16	79	21	57	17	5
					ERM		60714.29	27	11	9	7	81	12	69	5	14
					TEL		17230.61	27	11	9	16	79	21	57	17	5
					PEL		55878.88	27	11	9	7	81	12	69	5	14
					NEC		80000.00	27	11	9	4	79	7	71	2	19
					NERM	X	15986.59	27								
					NERH	X	51428.57	27								
409	PHENANTHRN	HA14	BT	NG/G	ERL		18571.43	27	13	13	18	78	38	41	19	3
					ERM		51428.57	27	13	13	10	72	22	50	9	19
					TEL		11512.99	27	13	13	20	72	38	34	25	3
					PEL		37263.54	27	13	13	12	72	25	47	13	16
					NEC	X	80000.00	27	13	13	5	63	9	53	6	31
					NERM	X	7137.25	27								
					NERH	X	27000.00	27								
409	PHENANTHRN	HA28	BT	NG/G	ERL	X	6140.35	27	24	13	26	65	23	42	19	16
					ERM	X	40000.00	27	24	13	13	66	13	53	8	26
					TEL	X	9907.74	27	24	13	25	63	21	42	19	18
					PEL	X	39613.52	27	24	13	13	66	13	53	8	26
					NEC	X	80000.00	27	24	13	7	63	6	56	5	32
					NERM	X	15986.59	27								
					NERH	X	39230.77	27								
410	ANTHRACENE	CR14	BT	NG/G	ERL		2456.14	27	11	9	18	74	21	52	21	5
					ERM		25000.00	27	11	9	7	81	12	69	5	14
					TEL		3756.38	27	11	9	17	71	19	52	7	21
					PEL		21926.45	27	11	9	7	81	12	69	5	14
					NEC		80000.00	27	11	9	2	74	2	71	2	24
					NERM	X	5744.95	27								
					NERH	X	19230.77	27								
410	ANTHRACENE	HA14	BT	NG/G	ERL	X	2456.14	27	13	12	21	69	38	31	28	3
					ERM	X	16609.39	27	13	12	9	69	19	50	9	22
					TEL	X	2324.54	27	13	12	21	69	38	31	28	3
					PEL	X	17872.08	27	13	12	9	69	19	50	9	22
					NEC	X	80000.00	27	13	12	2	59	3	56	3	38
					NERM	X	2200.00	27								
					NERH	X	19230.77	27								
410	ANTHRACENE	HA28	BT	NG/G	ERL	X	2200.00	27	24	12	25	60	19	40	21	19
					ERM	X	16609.39	27	24	12	10	65	10	55	6	29
					TEL	X	3908.68	27	24	12	20	61	16	45	16	23
					PEL	X	17872.08	27	24	12	10	65	10	55	6	29
					NEC	X	80000.00	27	24	12	2	61	2	60	2	37
					NERM	X	6944.44	27								
					NERH	X	19230.77	27								
411	FLUORANTHN	CR14	BT	NG/G	ERL		27027.03	27	11	8	14	79	19	60	14	7
					ERM		90357.14	27	11	8	4	83	10	74		17
					TEL		19784.49	27	11	8	15	76	19	57	17	7
					PEL		70203.79	27	11	8	7	81	12	69	5	14
					NEC		84269.66	27	11	8	6	83	12	71	2	14
					NERM	X	14482.76	27								
					NERH	X	54545.45	27								
411	FLUORANTHN	HA14	BT	NG/G	ERL		27027.03	27	13	12	16	78	34	44	16	6
					ERM	X	71252.48	27	13	12	9	69	19	50	9	22
					TEL	X	10165.56	27	13	12	19	69	34	34	25	6
					PEL	X	46233.91	27	13	12	11	75	25	50	9	16
					NEC	X	80000.00	27	13	12	9	69	19	50	9	22
					NERM	X	3823.53	27								
					NERH	X	30000.00	27								
411	FLUORANTHN	HA28	BT	NG/G	ERL	X	6333.33	27	24	12	27	56	19	37	24	19
					ERM	X	71252.48	27	24	12	10	65	10	55	6	29
					TEL	X	9577.27	27	24	12	23	56	16	40	21	23
					PEL	X	56439.39	27	24	12	11	66	11	55	6	27
					NEC	X	80000.00	27	24	12	10	65	10	55	6	29
					NERM	X	14482.76	27								
					NERH	X	44705.88	27								
412	PYRENE	CR14	BT	NG/G	ERL		25675.68	27	11	10	18	74	21	52	21	5
					ERM		81460.08	27	11	10	5	86	12	74		14
					TEL		25768.70	27	11	10	17	71	19	52	21	7
					PEL		71556.61	27	11	10	6	83	12	71	2	14

APPENDIX 3D: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRLTOC USING GL DATA

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APPENDIX 3D: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRLGLTOC USING GL DATA.

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APPENDIX 3D: SUMMARY OF SEC'S NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRLGLTOC USING GL DATA

5

APPENDIX 3D: SUMMARY OF SECs NORMALIZED TO TOTAL ORGANIC CARBON
SEC IN THRLTOC USING GL DATA

6

NUMCODE	CHEMCODE	TEST	SAMPTYP	UNITS	SEC	C	CONC	#			#	TOTAL							
								N	TOX	EFFECT		HIT	CORRECT	TOXHIT	NOTNOT	NOTHIT	TOXNOT		
452	PAH-H	HA28	BT	NG/G	ERL	X	87333.33	27	24	12	24	61	19	42	19	19			
					ERM	X	398676.47	27	24	12	9	66	10	56	5	29			
					TEL	X	92480.50	27	24	12	23	60	18	42	19	21			
					PEL	X	306551.37	27	24	12	11	66	11	55	6	27			
					NEC	X	720000.00	27	24	12	6	65	6	58	3	32			
					NERM	X	97931.03	27											
					NERH	X	235714.29	27											
508	PCB-T	CR14	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.
508	PCB-T	HA14	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.
508	PCB-T	HA28	BT	NG/G	NR	X	.	8	2	.	.	.	.	.	.	.

Appendix 4a Data grouped by chemical, test type, sample type, toxicity response, and sediment concentrations normalized to dry weight (in ascending order). A value bracketed by "~~" indicate published SECs (see Appendix 5). See Appendix 2c for a description of the chemical name for each abbreviated CHEM CODE. See Appendix 3a for additional descriptions of the headings for the columns. If SECs for a particular chemical are not reported (NR) for a test type and sample type in both Appendix 3a and Appendix 3b, then an ascending data table is not included in Appendix 4a for those SECs. If SECs for a particular chemical are not reported for a test type and sample type in Appendix 3a or in Appendix 3b, then these particular SECs for this particular test type and sample type are not reported in the ascending data table. Examples are included for copper and benzo[a]pyrene. The computer disk that accompanies the report contains the electronic version of this entire appendix (file name: "apdx4a.wp").

CONC	Concentration.
EFFECT	
NE	Non-toxic sample.
NC	No concordance (concentration of the chemical in a toxic sample was less than the mean concentration of the chemical in the non-toxic samples at a site; designated as no effect in the calculations of SECs).
SG	Small gradient (concentration of the chemical in a toxic sample 1 to ≤ 2 times the mean concentration of the chemical in the non-toxic samples at a site).
*	Concentration of the chemical in a toxic sample 2 to ≤ 4 times the mean concentration of the chemical in the non-toxic samples at a site.
**	Concentration of the chemical in a toxic sample > 4 the mean concentration of the chemical in the non-toxic samples at a site.
RATIO	Concentration of the chemical in the sample divided by the mean concentration of the chemical in the non-toxic samples at a site.
SITE	1: Indiana Harbor, 2: Buffalo River, 3: Saginaw River (1st survey), 4: Saginaw River (3rd survey), 5: Waukegan Harbor, 6: Upper Mississippi River, 7: Milltown Reservoir of the Clark Fork River, 8: Clark Fork River, 9: Trinity River, 10: Mobile Bay, 11: Tabbs Bay in Galveston Bay.
SAMPLE	Sample identification code. CO: control, RE: reference.
CEN	Censor. An @ indicates unreliable SEC (e.g., less than five of the samples were designated as toxic for the chemical or the frequency of toxic samples below the SEC was greater than the frequency of toxic samples above the SEC).
TOXICALL	Survival, growth, or maturation significantly less than the control response ($p \leq 0.05$).
SURV	Percentage survival normalized to the control response.
NT	Response not significantly less than the control response ($p > 0.05$).
TX	Response significantly less than the control response ($p \leq 0.05$).
GROW	Percentage growth normalized to the control response.
MATURE	Percentage maturation normalized to the control response (<i>Hyalella azteca</i> only).
ND	Not determined.
MINETOX	Minimum concentration in a toxic sample.

APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (--) SECs
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

1

----- NUMCODE=305 CHEM=Copper TEST=HA28 SAMPTYP=bottom sediment - sem UNITS=ng/g -----

CONC	EFFECT	RATIO	SITE	SAMPLE		CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
GL-SECs NOT REPORTED													
890.0	NC	0.1	3	SR-1-10		TOX	100.0	NT	97	TX	10	NT	NT
1017.0	NE	.	4	SR-3-06		NOT	100.0	NT	92	NT	96	NT	NT
1144.0	NC	0.1	3	SR-1-06		TOX	10.3	TX	60	TX	37	TX	
1334.0	NE	.	4	SR-3-02		NOT	103.8	NT	10	NT	10	NT	
1843.0	NE	.	4	SR-3-05		NOT	96.1	NT	94	NT	11	NT	
1843.0	NC	0.3	2	BR-1-09		TOX	88.2	TX	92	NT	10	NT	
2224.0	NE	.	2	BR-1-08		NOT	97.4	NT	10	NT	10	NT	
2796.0	NE	.	4	SR-3-24		NOT	102.6	NT	10	NT	10	NT	
2923.0	NE	.	4	SR-3-16		NOT	96.1	NT	10	NT	95	NT	
2986.0	NC	0.4	2	BR-1-07		TOX	80.3	TX	85	TX	10	NT	
3050.0	NE	.	4	SR-3-08		NOT	88.3	NT	92	NT	95	NT	
3177.0	NC	0.3	3	SR-1-03		TOX	96.2	NT	91	TX	10	NT	
3939.0	NC	0.6	2	BR-1-01		TOX	89.5	TX	96	NT	10	NT	
4384.0	NC	0.6	2	BR-1-03		TOX	79.0	TX	85	TX	10	NT	
5042.0	.	.			NERM-50% NO EFFECT								
5700.0	NE	.	7	MR-1-CO		NOT	100.0	NT	10	NT	10	NT	
6989.0	NC	0.6	1	IH-1-06		TOX	1.4	TX	68	NT	0.	NT	
9248.7	.	.			TEL-SR(ERL*NERM)								
10600.0	NC	0.1	7	MR-1-01		TOX	108.1	NT	79	TX	68	NT	
12000.0	NE	.	9	TR-1-CO		NOT	100.0	NT	ND	ND	ND	ND	
12000.0	NE	.	4	SR-3-CO		NOT	100.0	NT	10	NT	10	NT	
12000.0	NE	.	3	SR-1-CO		NOT	100.0	NT	10	NT	10	NT	
12000.0	NE	.	1	IH-1-CO		NOT	100.0	NT	10	NT	10	NT	
12000.0	NE	.	8	CF-1-CO		NOT	100.0	NT	10	NT	10	NT	
12000.0	NE	.	8	CF-1-06		NOT	120.3	NT	10	NT	90	NT	
12000.0	NE	.	2	BR-1-CO		NOT	100.0	NT	10	NT	10	NT	
12000.0	.	.			NERH-85% NO EFFECT								
15694.0	SG	1.3	1	IH-1-04		TOX	0.0	TX	ND	ND	ND	ND	
16965.0	SG	1.4	1	IH-1-07		TOX	0.0	TX	ND	ND	ND	ND	
16965.0	.	.			ERL-15% EFFECT								
17791.0	SG	1.5	1	IH-1-03		TOX	1.4	TX	96	NT	0.	NT	
50079.9	.	.			PEL-SR(ERM*NERH)								
77000.0	NE	.	8	CF-1-05		NOT	114.9	NT	98	NT	77	NT	
141000.0	SG	1.5	7	MR-1-02		TOX	109.3	NT	92	TX	95	NT	
178000.0	NE	.	7	MR-1-25		NOT	109.3	NT	95	NT	12	NT	
185000.0	*	2.0	7	MR-1-17		TOX	115.1	NT	92	TX	65	NT	
209000.0	.	.			ERM-50% EFFECT								
233000.0	*	2.5	7	MR-1-07		TOX	91.9	TX	91	TX	31	TX	
251000.0	NE	.	8	CF-1-04		NOT	128.4	NT	10	NT	80	NT	
287000.0	*	2.1	8	CF-1-03		TOX	123.0	NT	82	TX	93	NT	
325000.0	NE	.	8	CF-1-02		NOT	102.7	NT	94	NT	48	NT	
325000.0	.	.			NEC-MAX NO EFFECT								
354000.0	*	3.9	7	MR-1-19		TOX	114.0	NT	89	TX	63	NT	
607000.0	**	6.6	7	MR-1-11		TOX	90.7	NT	58	TX	24	TX	
6971000.0	**	51.5	8	CF-1-01		TOX	64.9	TX	73	TX	25	TX	

APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (~) SECs

2

----- NUMCODE=305 CHEM=Copper TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----

APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (~) SECs
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

3

----- NUMCODE=305 CHEM=Copper TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----
 (continued)

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
390000.0				--aet2--								
410000.0	NE	.	7	MR-1-25		NOT	109.3	NT	95	NT	12	NT
411000.0	SG	1.9	7	MR-1-07		TOX	91.9	TX	91	TX	31	TX
459000.0	*	2.1	7	MR-1-17		TOX	115.1	NT	92	TX	65	NT
478000.0	NE	.	8	CF-1-04		NOT	128.4	NT	10	NT	80	NT
480000.0	SG	1.9	8	CF-1-03		TOX	123.0	NT	82	TX	93	NT
530000.0				--aet3--								
583000.0	NE	.	8	CF-1-02		NOT	102.7	NT	94	NT	48	NT
583000.0				NEC-MAX NO EFFECT								
840000.0				--aet5--								
878000.0	*	4.0	7	MR-1-11		TOX	90.7	NT	58	TX	24	TX
1300000.0				--aet1--								
7820000.0	**	31.7	8	CF-1-01		TOX	64.9	TX	73	TX	25	TX

APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (~) SECs
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

4

----- NUMCODE=305 CHEM=Copper TEST=HA28 SAMPTYP=porewater UNITS=ug/l -----

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
0.6	NC	0.1	3	SR-1-03		TOX	96.2	NT	91	TX	10	NT
1.1	NE		4	SR-3-02		NOT	103.8	NT	10	NT	10	NT
1.3	NC	0.4	2	BR-1-03		TOX	79.0	TX	85	TX	10	NT
1.5	NE		8	CF-1-06		NOT	120.3	NT	10	NT	90	NT
1.7	NE		2	BR-1-08		NOT	97.4	NT	10	NT	10	NT
1.7	NC	0.5	2	BR-1-07		TOX	80.3	TX	85	TX	10	NT
1.9	NC	0.2	7	MR-1-01		TOX	108.1	NT	79	TX	68	NT
2.3	NC	0.7	2	BR-1-09		TOX	88.2	TX	92	NT	10	NT
2.6	NC	0.6	3	SR-1-10		TOX	100.0	NT	97	TX	10	NT
2.7				GL-NERM-50% NO EFFECT								
2.7	NE		4	SR-3-01		NOT	97.4	NT	94	NT	11	NT
3.0				GL-TEL-SR(ERL*NERM)	@							
3.0	NE		4	SR-3-08		NOT	88.3	NT	92	NT	95	NT
3.0	NE		4	SR-3-06		NOT	100.0	NT	92	NT	96	NT
3.3	SG	1.0	2	BR-1-01		TOX	89.5	TX	96	NT	10	NT
3.3				GL-ERL-15% EFFECT								
3.7	NC	0.4	7	MR-1-02		TOX	109.3	NT	92	TX	95	NT
3.7				NERM-50% NO EFFECT								
4.4				TEL-SR(ERL*NERM)	@							
4.7	NE		9	TR-1-CO		NOT	100.0	NT	ND	ND	ND	ND
4.7	NE		4	SR-3-CO		NOT	100.0	NT	10	NT	10	NT
4.7	NE		3	SR-1-CO		NOT	100.0	NT	10	NT	10	NT
4.7	NE		1	IH-1-CO		NOT	100.0	NT	10	NT	10	NT
4.7	NE		8	CF-1-CO		NOT	100.0	NT	10	NT	10	NT
4.7	NE		2	BR-1-CO		NOT	100.0	NT	10	NT	10	NT
4.7				GL-NERH-85% NO EFFECT								
4.7				GL-NEC-MAX NO EFFECT								
5.3	SG	1.1	1	IH-1-06		TOX	1.4	TX	68	NT	0	NT
5.3				ERL-15% EFFECT								
5.4	NE		7	MR-1-CO		NOT	100.0	NT	10	NT	10	NT
8.7	NE		8	CF-1-05		NOT	114.9	NT	98	NT	77	NT
8.8	NE		8	CF-1-04		NOT	128.4	NT	10	NT	80	NT
8.8				NERH-85% NO EFFECT								
9.5	NC	0.9	7	MR-1-07		TOX	91.9	TX	91	TX	31	TX
9.5				GL-PEL-SR(ERM*NERH)								
13.2				PEL-SR(ERM*NERH)								
14.8	SG	1.4	7	MR-1-17		TOX	115.1	NT	92	TX	65	NT
15.1	NE		7	MR-1-25		NOT	109.3	NT	95	NT	12	NT
16.4	SG	1.4	8	CF-1-03		TOX	123.0	NT	82	TX	93	NT
19.1	**	4.1	1	IH-1-04		TOX	0.0	TX	ND	ND	ND	ND
19.5				GL-ERM-50% EFFECT								
19.8	**	4.2	3	SR-1-06		TOX	10.3	TX	60	TX	37	TX
19.8				ERM-50% EFFECT								
21.4	**	4.6	1	IH-1-03		TOX	1.4	TX	96	NT	0	NT
35.6	NE		8	CF-1-02		NOT	102.7	NT	94	NT	48	NT
35.6				NEC-MAX NO EFFECT								
79.4	**	6.7	8	CF-1-01		TOX	64.9	TX	73	TX	25	TX
89.9	**	8.8	7	MR-1-11		TOX	90.7	NT	58	TX	24	TX
102.0	**	10.0	7	MR-1-19		TOX	114.0	NT	89	TX	63	NT
126.3	**	27.0	1	IH-1-07		TOX	0.0	TX	ND	ND	ND	ND

APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (~) SECs
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

5

----- NUMCODE=417 CHEM=Benzo(a)pyrene TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
0.0	NE	.	11	TB-1-RE	NOT	100.0	NT	10	NT	ND	ND	ND
6.0	NC	0.6	3	SR-1-10	TOX	100.0	NT	97	TX	10	NT	ND
10.0	NE	.	5	WH-1-CO	NOT	100.0	NT	10	NT	ND	ND	ND
10.0	NE	.	6	UM-1-CO	NOT	100.0	NT	ND	ND	ND	ND	ND
10.0	NE	.	9	TR-1-CO	NOT	100.0	NT	ND	ND	ND	ND	ND
10.0	NE	.	9	TR-1-02	NOT	100.0	NT	ND	ND	ND	ND	ND
10.0	NC	1.0	11	TB-1-03	TOX	52.3	TX	97	NT	ND	ND	ND
10.0	NC	1.0	11	TB-1-01	TOX	0.0	TX	ND	ND	ND	ND	ND
10.0	NE	.	4	SR-3-CO	NOT	100.0	NT	10	NT	10	NT	NT
10.0	NE	.	3	SR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
10.0	NE	.	7	MR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
10.0	NE	.	7	MR-1-25	NOT	109.3	NT	95	NT	12	NT	NT
10.0	NG	1.0	7	MR-1-17	TOX	115.1	NT	92	TX	65	NT	NT
10.0	NG	1.0	7	MR-1-11	TOX	90.7	NT	58	TX	24	TX	TX
10.0	NG	1.0	7	MR-1-07	TOX	91.9	TX	91	TX	31	TX	TX
10.0	NG	1.0	7	MR-1-02	TOX	109.3	NT	92	TX	95	NT	NT
10.0	NG	1.0	7	MR-1-01	TOX	108.1	NT	79	TX	68	NT	NT
10.0	NE	.	1	IH-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
10.0	NE	.	8	CF-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
10.0	NE	.	8	CF-1-06	NOT	120.3	NT	10	NT	90	NT	NT
10.0	NE	.	8	CF-1-05	NOT	114.9	NT	98	NT	77	NT	NT
10.0	NE	.	8	CF-1-04	NOT	128.4	NT	10	NT	80	NT	NT
10.0	NC	0.9	8	CF-1-03	TOX	123.0	NT	82	TX	93	NT	NT
10.0	NE	.	2	BR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
12.5	.	.		NERM-50% NO EFFECT								
15.0	NE	.	8	CF-1-02	NOT	102.7	NT	94	NT	48	NT	NT
20.0	NE	.	6	UM-1-RE	NOT	86.5	NT	ND	ND	ND	ND	ND
20.0	NE	.	11	TB-1-04	NOT	93.2	NT	10	NT	ND	ND	ND
20.0	SG	2.0	11	TB-1-02	TOX	11.4	TX	72	TX	ND	ND	ND
24.0	NE	.	9	TR-1-01	NOT	81.4	NT	ND	ND	ND	ND	ND
25.0	NC	1.0	5	WH-1-02	TOX	36.5	TX	74	TX	ND	ND	ND
30.0	NE	.	6	UM-1-01	NOT	119.3	NT	ND	ND	ND	ND	ND
31.9	.	.		--telff--								
32.4	.	.		TEL-SR(ERL*NERM)								
41.0	NE	.	5	WH-1-RE	NOT	109.5	NT	11	NT	ND	ND	ND
48.0	**	4.8	7	MR-1-19	TOX	114.0	NT	89	TX	63	NT	NT
56.0	NE	.	6	UM-1-02	NOT	117.9	NT	ND	ND	ND	ND	ND
62.0	NE	.	9	TR-1-04	NOT	82.9	NT	ND	ND	ND	ND	ND
80.0	NE	.	9	TR-1-03	NOT	98.6	NT	ND	ND	ND	ND	ND
82.0	NE	.	6	UM-1-03	NOT	114.9	NT	ND	ND	ND	ND	ND
84.0	**	7.6	8	CF-1-01	TOX	64.9	TX	73	TX	25	TX	TX
84.0	.	.		ERL-15% EFFECT								
87.0	NE	.	10	MB-1-03	NOT	95.5	NT	ND	ND	ND	ND	ND
88.8	.	.		--telm--								
100.0	NE	.	10	MB-1-RE	NOT	100.0	NT	ND	ND	ND	ND	ND
100.0	NE	.	10	MB-1-02	NOT	97.0	NT	ND	ND	ND	ND	ND
100.5	.	.		GL-NERM-50% NO EFFECT								
160.0	NE	.	4	SR-3-06	NOT	100.0	NT	92	NT	96	NT	NT
167.7	.	.		GL-TEL-SR(ERL*NERM)								
180.0	NE	.	10	MB-1-04	NOT	95.5	NT	ND	ND	ND	ND	ND
210.0	**	21.0	3	SR-1-06	TOX	10.3	TX	60	TX	37	TX	TX
220.0	NE	.	4	SR-3-05	NOT	96.1	NT	94	NT	11	NT	NT
220.0	.	.		NERH-85% NO EFFECT								
230.0	NE	.	4	SR-3-16	NOT	96.1	NT	10	NT	95	NT	NT
250.0	NE	.	4	SR-3-08	NOT	88.3	NT	92	NT	95	NT	NT
250.0	NE	.	4	SR-3-02	NOT	103.8	NT	10	NT	10	NT	NT
270.0	NE	.	4	SR-3-01	NOT	97.4	NT	94	NT	11	NT	NT
270.0	.	.		GL-NERH-85% NO EFFECT								
280.0	**	28.0	3	SR-1-03	TOX	96.2	NT	91	TX	10	NT	NT
280.0	.	.		GL-ERL-15% EFFECT								
319.8	.	.		PEL-SR(ERM*NERH)								
350.0	NE	.	2	BR-1-08	NOT	97.4	NT	10	NT	10	NT	NT
409.1	.	.		GL-PEL-SR(ERM*NERH)								
430.0	.	.		--erl--								
440.0	NE	.	4	SR-3-24	NOT	102.6	NT	10	NT	10	NT	NT

{ APPENDIX 4a: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO DRY WEIGHT
 INCLUDES NBS AND OTHER (--) SECs
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

6

----- NUMCODE=417 CHEM=Benzo(a)pyrene TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----
 (continued)

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
440.0	*	2.4	2	BR-1-09		TOX	88.2	TX	92	NT	10	NT
440.0				GL-NEC-MAX NO EFFECT								
460.0	**	18.0	5	WH-1-01		TOX	71.7	TX	91	NT	ND	ND
465.0				ERM-50% EFFECT								
470.0	*	2.6	2	BR-1-03		TOX	79.0	TX	85	TX	10	NT
620.0	*	3.4	2	BR-1-07		TOX	80.3	TX	85	TX	10	NT
620.0				GL-ERM-50% EFFECT								
763.0				--pelm--								
782.0				--pelf--								
1000.0	NE		10	MB-1-01		NOT	75.8	NT	ND	ND	ND	ND
1000.0				NEC-MAX NO EFFECT								
1580.0				--aet6--								
1600.0				--erm--								
1600.0				--aet4--								
1600.0				--aet2--								
3000.0				--aet1--								
3600.0				--aet3--								
5800.0	**	32.2	2	BR-1-01		TOX	89.5	TX	96	NT	10	NT
7000.0	**	700.0	1	IH-1-04		TOX	0.0	TX	ND	ND	ND	ND
10000.0	**	1000.0	1	IH-1-03		TOX	1.4	TX	96	NT	0.	NT
18200.0				--aet5--								
21000.0	**	2100.0	1	IH-1-07		TOX	0.0	TX	ND	ND	ND	ND
22000.0				--eqp--								
25000.0	**	2500.0	1	IH-1-06		TOX	1.4	TX	68	NT	0.	NT

Appendix 4b PAH or PCB data grouped by chemical, test type, sample type, toxicity response, and sediment concentrations normalized to total organic carbon (TOC; in ascending order). See legend for Appendix 4a for a description of the headings. An example is included for benzo[a]pyrene. The computer disk that accompanies the report contains the electronic version of this entire appendix (file name: "apdx4b.wp").

APPENDIX 4b: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO TOTAL ORGANIC CARBON

1

NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

----- NUMCODE=417 CHEM=Benzo(a)pyrene TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM
2.0	NE	.	11	TB-1-RE	NOT	100.0	NT	10	NT	ND	ND	ND
149.3	NE	.	8	CF-1-06	NOT	120.3	NT	10	NT	90	NT	NT
312.5	NE	.	7	MR-1-25	NOT	109.3	NT	95	NT	12	NT	NT
322.6	NE	.	8	CF-1-04	NOT	128.4	NT	10	NT	80	NT	NT
370.4	NC	0.6	7	MR-1-11	TOX	90.7	NT	58	TX	24	TX	TX
416.7	NC	0.7	7	MR-1-07	TOX	91.9	TX	91	TX	31	TX	TX
438.6	NC	0.4	5	WH-1-02	TOX	36.5	TX	74	TX	ND	ND	ND
526.3	NC	0.9	7	MR-1-17	TOX	115.1	NT	92	TX	65	NT	NT
600.0	NC	0.6	3	SR-1-10	TOX	100.0	NT	97	TX	10	NT	NT
697.7	NE	.	6	UM-1-01	NOT	119.3	NT	ND	ND	ND	ND	ND
714.3	SG	1.2	8	CF-1-03	TOX	123.0	NT	82	TX	93	NT	NT
833.3	NE	.	8	CF-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
833.3	NE	.	8	CF-1-05	NOT	114.9	NT	98	NT	77	NT	NT
882.4	NE	.	8	CF-1-02	NOT	102.7	NT	94	NT	48	NT	NT
909.1	NC	1.0	11	TB-1-03	TOX	52.3	TX	97	NT	ND	ND	ND
909.1	NE	.	7	MR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
1000.0	NE	.	5	WH-1-CO	NOT	100.0	NT	10	NT	ND	ND	ND
1000.0	NE	.	6	UM-1-CO	NOT	100.0	NT	ND	ND	ND	ND	ND
1000.0	NE	.	9	TR-1-CO	NOT	100.0	NT	ND	ND	ND	ND	ND
1000.0	NE	.	4	SR-3-CO	NOT	100.0	NT	10	NT	10	NT	NT
1000.0	NE	.	3	SR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
1000.0	SG	1.6	7	MR-1-01	TOX	108.1	NT	79	TX	68	NT	NT
1000.0	NE	.	1	IH-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
1000.0	NE	.	2	BR-1-CO	NOT	100.0	NT	10	NT	10	NT	NT
1102.9	.	.	NERM-50% NO EFFECT				.	.	.	.	.	.
1158.8	.	.	TEL-SR(ERL*NERM)				.	.	.	.	.	.
1205.9	NE	.	5	WH-1-RE	NOT	109.5	NT	11	NT	ND	ND	ND
1217.4	*	2.0	8	CF-1-01	TOX	64.9	TX	73	TX	25	TX	TX
1217.4	.	.	ERL-15% EFFECT				.	.	.	.	.	.
1250.0	*	2.0	7	MR-1-02	TOX	109.3	NT	92	TX	95	NT	NT
1250.0	NE	.	10	MB-1-RE	NOT	100.0	NT	ND	ND	ND	ND	ND
1428.6	NE	.	6	UM-1-RE	NOT	86.5	NT	ND	ND	ND	ND	ND
1666.7	NE	.	10	MB-1-02	NOT	97.0	NT	ND	ND	ND	ND	ND
1818.2	NE	.	11	TB-1-04	NOT	93.2	NT	10	NT	ND	ND	ND
1818.2	SG	2.0	11	TB-1-02	TOX	11.4	TX	72	TX	ND	ND	ND
2900.0	NE	.	10	MB-1-03	NOT	95.5	NT	ND	ND	ND	ND	ND
3111.1	NE	.	6	UM-1-02	NOT	117.9	NT	ND	ND	ND	ND	ND
3333.3	NE	.	9	TR-1-02	NOT	100.0	NT	ND	ND	ND	ND	ND
3692.3	**	6.0	7	MR-1-19	TOX	114.0	NT	89	TX	63	NT	NT
3727.3	NE	.	6	UM-1-03	NOT	114.9	NT	ND	ND	ND	ND	ND
4075.2	.	.	GL-NERM-50% NO EFFECT				.	.	.	.	.	.
4800.0	NE	.	9	TR-1-01	NOT	81.4	NT	ND	ND	ND	ND	ND
5000.0	**	5.5	11	TB-1-01	TOX	0.0	TX	ND	ND	ND	ND	ND
6383.7	.	.	GL-TEL-SR(ERL*NERM)				.	.	.	.	.	.
6944.4	NE	.	4	SR-3-08	NOT	88.3	NT	92	NT	95	NT	NT
7931.0	NE	.	4	SR-3-16	NOT	96.1	NT	10	NT	95	NT	NT
9000.0	NE	.	10	MB-1-04	NOT	95.5	NT	ND	ND	ND	ND	ND
9333.3	**	9.3	3	SR-1-03	TOX	96.2	NT	91	TX	10	NT	NT
10000.0	**	10.0	3	SR-1-06	TOX	10.3	TX	60	TX	37	TX	TX
10000.0	.	.	GL-ERL-15% EFFECT				.	.	.	.	.	.
11000.0	NE	.	4	SR-3-24	NOT	102.6	NT	10	NT	10	NT	NT
11111.1	NE	.	10	MB-1-01	NOT	75.8	NT	ND	ND	ND	ND	ND
11216.2	.	.	ERM-50% EFFECT				.	.	.	.	.	.
12432.4	**	11.3	5	WH-1-01	TOX	71.7	TX	91	NT	ND	ND	ND
13185.3	.	.	PEL-SR(ERM*NERH)				.	.	.	.	.	.
15500.0	NE	.	9	TR-1-04	NOT	82.9	NT	ND	ND	ND	ND	ND
15500.0	.	.	NERH-85% NO EFFECT				.	.	.	.	.	.
15714.3	NE	.	4	SR-3-05	NOT	96.1	NT	94	NT	11	NT	NT
19230.8	NE	.	4	SR-3-02	NOT	103.8	NT	10	NT	10	NT	NT
20000.0	SG	1.9	2	BR-1-09	TOX	88.2	TX	92	NT	10	NT	NT
20588.2	NE	.	2	BR-1-08	NOT	97.4	NT	10	NT	10	NT	NT
20588.2	.	.	GL-NERH-85% NO EFFECT				.	.	.	.	.	.
23500.0	*	2.2	2	BR-1-03	TOX	79.0	TX	85	TX	10	NT	NT
26666.7	NE	.	9	TR-1-03	NOT	98.6	NT	ND	ND	ND	ND	ND
27000.0	NE	.	4	SR-3-01	NOT	97.4	NT	94	NT	11	NT	NT
27401.9	.	.	GL-PEL-SR(ERM*NERH)				.	.	.	.	.	.

APPENDIX 4b: ASCENDING DATA TABLES (ALL DATA) NORMALIZED TO TOTAL ORGANIC CARBON

2

NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

----- NUMCODE=417 CHEM=Benzo(a)pyrene TEST=HA28 SAMPTYP=bottom sediment - total UNITS=ng/g -----
 (continued)

CONC	EFFECT	RATIO	SITE	SAMPLE	CEN	TOXIC	SURV	TOXS	GROW	TOXG	MATURE	TOXM	
36470.6	*	3.4	2	BR-1-07			TOX	80.3	TX	85	TX	10	NT
36470.6					GL-ERM-50%	EFFECT							
65168.5	**	6.0	2	BR-1-01			TOX	89.5	TX	96	NT	10	NT
80000.0	NE	.	4	SR-3-06			NOT	100.0	NT	92	NT	96	NT
80000.0					NEC-MAX	NO EFFECT							
80000.0					GL-NEC-MAX	NO EFFECT							
125000.0	**	125.0	1	IH-1-04			TOX	0.0	TX	ND	ND	ND	ND
129870.1	**	129.9	1	IH-1-03			TOX	1.4	TX	96	NT	0.	NT
215517.2	**	215.5	1	IH-1-06			TOX	1.4	TX	68	NT	0.	NT
238636.4	**	238.6	1	IH-1-07			TOX	0.0	TX	ND	ND	ND	ND

Appendix 5 Other published toxicity data grouped by chemical, test type, sample type, toxicity response, and sediment concentrations normalized to dry weight (in ascending order). Study Codes: (1) MCGEE: McGee et al. (1994) and Schlekat et al. (1994); (2) DAY: Day et al. (1995); (3) HOKE: Hoke et al. (1995); (3) JFLD: Field and Cairncross (1994); and (4) SUPRF: M.D. Sprenger, USEPA, Edison, NJ (unpublished data). Tests: (1) HA10 to HA28: *Hyalella azteca* 10- to 28-d test; (2) CR14: *Chironomus riparius* 14-d test; (3) TT28: *Tubifex tubifex* 28-d test; and (4) HS28: *Hexagenia* spp. 28-d test. See Appendix 2c for a description of the chemical name for each abbreviated CHEM CODE. The first four pages of this appendix are included on the following pages of the report. The computer disk that accompanies the report contains the electronic version of this entire appendix (file name: "apdx5.wp").

SAMPLE COLLECTIONS SORTED BY CONCENTRATION
 NE no effect | NC<1 | NG=1 | SG 1-2 | * 2-4 | **>4

----- NUMCODE=101 CHEMCODE=TOC UNITS=pcnt -----

CONC	EFFECT	RATIO	STUDY	TEST	SAMPLE	SAMP TYPE	TOXIC	SURV	TOXS	GROW	TOXG
0.51	NE	.	SUPRF	HA10	MA05	BT	NOT	88.30	NT	0.18	NT
0.71	NE	.	JFLD	CT10	1111-02-RS15-01	BT	NOT	85.00	NT	4.59	NT
0.73	NC	0.3	JFLD	CT14	1111-02-RS07-01	BT	TOX	60.00	TX	3.76	NT
0.91	NC	0.3	JFLD	CT14	1111-02-AS07-01	BT	TOX	40.00	TX	2.73	TX
1.20	NE	.	JFLD	CT14	1111-02-AS12-01	BT	NOT	92.50	NT	4.17	NT
1.20	NC	0.2	SUPRF	HA10	OE04	BT	TOX	18.00	TX	4.73	NT
1.24	NE	.	DAY	CR14	CM17	BT	NOT	80.00	NT	0.46	NT
1.24	NE	.	DAY	HA28	CM17	BT	NOT	94.70	NT	0.49	NT
1.24	NE	.	MCGEE	HA28	BR7	BT	NOT	81.30	NT	3.82	NT
1.24	NE	.	DAY	HS28	CM17	BT	NOT	94.00	NT	2.03	NT
1.24	NE	.	DAY	TT28	CM17	BT	NOT	40.00	NT	73.00	NT
1.44	NE	.	MCGEE	HA28	BR5	BT	NOT	95.00	NT	4.09	NT
1.48	NE	.	MCGEE	HA28	BR3	BT	NOT	90.00	NT	3.99	NT
1.66	NE	.	MCGEE	HA28	BR6	BT	NOT	91.30	NT	3.88	NT
1.72	NE	.	DAY	CR14	SL04	BT	NOT	73.30	NT	0.50	NT
1.72	NE	.	DAY	HA28	SL04	BT	NOT	90.00	NT	0.59	NT
1.72	NE	.	DAY	HS28	SL04	BT	NOT	96.70	NT	4.41	NT
1.72	NC	0.6	DAY	TT28	SL04	BT	TOX	21.00	TX	109.00	NT
1.77	NE	.	DAY	CR14	CW01	BT	NOT	88.00	NT	0.38	NT
1.77	NE	.	DAY	HA28	CW01	BT	NOT	89.30	NT	0.72	NT
1.77	NE	.	DAY	HS28	CW01	BT	NOT	98.00	NT	6.87	NT
1.77	NC	0.6	DAY	TT28	CW01	BT	TOX	22.00	TX	22.00	TX
1.85	NE	.	DAY	CR14	CW05	BT	NOT	86.70	NT	0.33	NT
1.85	NE	.	DAY	HA28	CW05	BT	NOT	90.70	NT	0.42	NT
1.85	NE	.	DAY	HS28	CW05	BT	NOT	100.00	NT	6.17	NT
1.85	NC	0.6	DAY	TT28	CW05	BT	TOX	26.00	NT	29.00	TX
1.87	NE	.	DAY	CR14	CM15	BT	NOT	86.70	NT	0.50	NT
1.87	NE	.	DAY	HA28	CM15	BT	NOT	88.00	NT	0.54	NT
1.87	NE	.	DAY	HS28	CM15	BT	NOT	94.00	NT	3.30	NT
1.87	NE	.	DAY	TT28	CM15	BT	NOT	43.00	NT	102.00	NT
1.94	NE	.	MCGEE	HA28	BR2	BT	NOT	80.00	NT	4.12	NT
2.04	NE	.	MCGEE	HA28	BR1	BT	NOT	90.00	NT	4.12	NT
2.06	NE	.	DAY	CR14	CW21	BT	NOT	84.00	NT	0.58	NT
2.06	NE	.	DAY	HA28	CW21	BT	NOT	89.30	NT	0.74	NT
2.06	NE	.	MCGEE	HA28	BR4	BT	NOT	85.00	NT	3.96	NT
2.06	NE	.	DAY	HS28	CW21	BT	NOT	98.00	NT	9.97	NT
2.06	NE	.	DAY	TT28	CW21	BT	NOT	45.00	NT	117.00	NT
2.08	NE	.	DAY	CR14	CW06	BT	NOT	82.70	NT	0.36	NT
2.08	NE	.	DAY	CR14	CW12	BT	NOT	89.30	NT	0.52	NT
2.08	NE	.	DAY	HA28	CW06	BT	NOT	94.70	NT	0.53	NT
2.08	NE	.	DAY	HA28	CW12	BT	NOT	94.70	NT	0.70	NT
2.08	NE	.	DAY	HS28	CW06	BT	NOT	94.00	NT	5.35	NT
2.08	NE	.	DAY	HS28	CW12	BT	NOT	80.00	NT	10.12	NT
2.08	NE	.	DAY	TT28	CW12	BT	NOT	45.00	NT	172.00	NT
2.08	NC	0.7	DAY	TT28	CW06	BT	TOX	24.00	TX	22.00	TX
2.20	NE	.	JFLD	CT14	1111-02-RS14-01	BT	NOT	77.50	NT	4.34	NT
2.22	NE	.	DAY	CR14	CW22	BT	NOT	88.00	NT	0.55	NT
2.22	NC	0.8	DAY	HA28	CW22	BT	TOX	77.30	TX	0.71	NT
2.22	NE	.	DAY	HS28	CW22	BT	NOT	98.00	NT	9.11	NT
2.22	NE	.	DAY	TT28	CW22	BT	NOT	43.00	NT	74.00	NT

2.34	NE	.	DAY	CR14	CW24	BT	NOT	76.00	NT	0.51	NT
2.34	NE	.	SUPRF	HA10	CS04	BT	NOT	93.30	NT	0.50	NT
2.34	NE	.	DAY	HA28	CW24	BT	NOT	90.70	NT	0.66	NT
2.34	NE	.	DAY	HS28	CW24	BT	NOT	98.00	NT	8.53	NT
2.34	NE	.	DAY	TT28	CW24	BT	NOT	42.00	NT	62.00	NT
2.36	NE	.	MCGEE	HA28	CON2	BT	NOT	88.70	NT	3.70	NT
2.40	NE	.	JFLD	CT14	1111-02-RS13-01	BT	NOT	72.50	NT	3.20	NT
2.44	NE	.	DAY	CR14	CW23	BT	NOT	96.00	NT	0.35	NT
2.44	NE	.	DAY	HA28	CW23	BT	NOT	90.70	NT	0.71	NT
2.44	NE	.	DAY	HS28	CW23	BT	NOT	100.00	NT	7.98	NT
2.44	NC	0.8	DAY	TT28	CW23	BT	TOX	39.00	NT	43.00	TX
2.45	NE	.	DAY	CR14	CW14	BT	NOT	86.70	NT	0.61	NT
2.45	NE	.	DAY	HA28	CW14	BT	NOT	84.00	NT	0.74	NT
2.45	NE	.	DAY	HS28	CW14	BT	NOT	100.00	NT	10.59	NT
2.45	NE	.	DAY	TT28	CW14	BT	NOT	46.00	NT	135.00	NT
2.52	NE	.	DAY	CR14	CW15	BT	NOT	85.30	NT	0.49	NT
2.52	NE	.	DAY	HA28	CW15	BT	NOT	82.70	NT	0.76	NT
2.52	NE	.	DAY	HS28	CW15	BT	NOT	100.00	NT	10.94	NT
2.52	NE	.	DAY	TT28	CW15	BT	NOT	43.00	NT	126.00	NT
2.53	NE	.	MCGEE	HA28	BR9	BT	NOT	90.00	NT	3.94	NT
2.59	NE	.	DAY	CR14	CW13	BT	NOT	76.00	NT	0.51	NT
2.59	NE	.	DAY	HA28	CW13	BT	NOT	88.00	NT	0.66	NT
2.59	NE	.	DAY	HS28	CW13	BT	NOT	100.00	NT	10.93	NT
2.59	NE	.	DAY	TT28	CW13	BT	NOT	44.00	NT	126.00	NT
2.63	NE	.	DAY	CR14	CW18	BT	NOT	86.70	NT	0.66	NT
2.63	NE	.	DAY	HA28	CW18	BT	NOT	93.30	NT	0.82	NT
2.63	NE	.	DAY	HS28	CW18	BT	NOT	98.00	NT	11.15	NT
2.63	NE	.	DAY	TT28	CW18	BT	NOT	47.00	NT	147.00	NT
2.65	NE	.	DAY	CR14	CW09	BT	NOT	85.30	NT	0.40	NT
2.65	NE	.	DAY	HA28	CW09	BT	NOT	84.00	NT	0.50	NT
2.65	NE	.	DAY	HS28	CW09	BT	NOT	100.00	NT	4.56	NT
2.65	NE	.	DAY	TT28	CW09	BT	NOT	29.00	NT	56.00	NT
2.68	NE	.	MCGEE	HA28	BR8	BT	NOT	93.80	NT	3.88	NT
2.69	NE	.	DAY	CR14	SL07	BT	NOT	71.10	NT	0.41	NT
2.69	NE	.	DAY	HA28	SL07	BT	NOT	82.70	NT	0.95	NT
2.69	NE	.	DAY	HS28	SL07	BT	NOT	98.00	NT	5.98	NT
2.69	NC	0.9	DAY	TT28	SL07	BT	TOX	15.00	TX	152.00	NT
2.72	NE	.	DAY	CR14	CM05	BT	NOT	84.00	NT	0.36	NT
2.72	NE	.	DAY	HA28	CM05	BT	NOT	86.70	NT	0.50	NT
2.72	NE	.	DAY	HS28	CM05	BT	NOT	100.00	NT	5.16	NT
2.72	NC	0.9	DAY	TT28	CM05	BT	TOX	31.00	NT	37.00	TX
2.80	NC	0.5	SUPRF	HA10	OE21	BT	TOX	0.00	TX	.	NR
2.90	NE	.	DAY	CR14	VS01	BT	NOT	84.00	NT	0.43	NT
2.90	SG	1.1	JFLD	CT14	1111-02-AS09-01	BT	TOX	42.50	TX	3.03	TX
2.90	NE	.	SUPRF	HA10	MA06	BT	NOT	81.70	NT	0.16	NT
2.90	NE	.	DAY	HA28	VS01	BT	NOT	88.00	NT	0.61	NT
2.90	SG	1.0	DAY	HS28	VS01	BT	TOX	94.00	NT	0.19	TX
2.90	NE	.	DAY	TT28	VS01	BT	NOT	26.00	NT	30.00	NT
2.93	NE	.	DAY	CR14	CW17	BT	NOT	89.30	NT	0.64	NT
2.93	NE	.	DAY	CR14	VS03	BT	NOT	85.30	NT	0.33	NT
2.93	NE	.	DAY	HA28	CW17	BT	NOT	86.70	NT	0.87	NT
2.93	NE	.	DAY	HA28	VS03	BT	NOT	97.30	NT	0.42	NT
2.93	NE	.	DAY	HS28	CW17	BT	NOT	94.00	NT	10.40	NT
2.93	SG	1.0	DAY	HS28	VS03	BT	TOX	90.00	NT	0.01	TX
2.93	NE	.	DAY	TT28	CW17	BT	NOT	43.00	NT	154.00	NT
2.93	NC	1.0	DAY	TT28	VS03	BT	TOX	21.00	NT	22.00	TX
2.95	NE	.	JFLD	CT14	1111-02-RS11-01	BT	NOT	90.00	NT	4.64	NT

3.05	SG	1.1	JFLD	CT14	1111-02-RS12-01	BT	TOX	52.50	TX	1.32	TX		
3.06	NE	.	DAY	CR14	CW16	BT	NOT	90.70	NT	0.65	NT		
3.06	NE	.	DAY	HA28	CW16	BT	NOT	89.30	NT	0.79	NT		
3.06	NE	.	DAY	HS28	CW16	BT	NOT	100.00	NT	10.58	NT		
3.20	SG	1.2	JFLD	CT14	1111-02-AS08-01	BT	TOX	17.50	TX	0.72	TX		
3.20	NE	.	SUPRF	HA10	MA09	BT	NOT	78.30	NT	0.17	NT		
3.25	NE	.	JFLD	CT14	1111-02-AS06-01	BT	NOT	82.50	NT	4.07	NT		
3.28	NE	.	DAY	CR14	CM09	BT	NOT	75.30	NT	0.46	NT		
3.28	NE	.	DAY	HA28	CM09	BT	NOT	93.30	NT	0.67	NT		
3.28	SG	1.2	DAY	HS28	CM09	BT	TOX	90.00	NT	3.39	TX		
3.28	NE	.	DAY	TT28	CM09	BT	NOT	44.00	NT	113.00	NT		
3.33	NE	.	DAY	CR14	CM11	BT	NOT	72.00	NT	0.39	NT		
3.33	NE	.	DAY	HA28	CM11	BT	NOT	96.00	NT	0.53	NT		
3.33	SG	1.2	DAY	HS28	CM11	BT	TOX	100.00	NT	4.15	TX		
3.33	NE	.	DAY	TT28	CM11	BT	NOT	45.00	NT	91.00	NT		
3.40	NE	.	DAY	CR14	CM22	BT	NOT	82.70	NT	0.42	NT		
3.40	**	4.8	JFLD	CT10	1111-02-AS03-01	BT	TOX	82.50	NT	3.78	TX		
3.40	NE	.	SUPRF	HA10	MA07	BT	NOT	88.30	NT	0.23	NT		
3.40	NE	.	SUPRF	HA10	MA13	BT	NOT	71.70	NT	0.18	NT		
3.40	NE	.	DAY	HA28	CM22	BT	NOT	93.30	NT	0.87	NT		
3.40	NE	.	DAY	HS28	CM22	BT	NOT	100.00	NT	4.61	NT		
3.40	NE	.	DAY	TT28	CM22	BT	NOT	37.00	NT	150.00	NT		
3.48	NE	.	DAY	CR14	CW03	BT	NOT	80.00	NT	0.43	NT		
3.48	NE	.	DAY	HA28	CW03	BT	NOT	90.00	NT	0.66	NT		
3.48	NE	.	DAY	HS28	CW03	BT	NOT	100.00	NT	5.78	NT		
3.48	SG	1.1	DAY	TT28	CW03	BT	TOX	22.00	TX	15.00	TX		
3.50	NE	.	DAY	CR14	SL02	BT	NOT	77.80	NT	0.39	NT		
3.50	NC	0.6	SUPRF	HA10	OE10	BT	TOX	16.00	TX	3.16	TX		
3.50	NE	.	DAY	HA28	SL02	BT	NOT	89.30	NT	0.69	NT		
3.50	NE	.	DAY	HS28	SL02	BT	NOT	98.00	NT	3.15	NT		
3.50	SG	1.2	DAY	TT28	SL02	BT	TOX	16.00	TX	147.00	NT		
3.55	SG	1.3	JFLD	CT14	1111-02-RS01-01	BT	TOX	60.00	TX	4.44	NT		
3.63	NE	.	DAY	CR14	CM07	BT	NOT	82.70	NT	0.47	NT		
3.63	NE	.	DAY	HA28	CM07	BT	NOT	85.60	NT	0.74	NT		
3.63	SG	1.3	DAY	HS28	CM07	BT	TOX	89.00	NT	4.58	TX		
3.63	NE	.	DAY	TT28	CM07	BT	NOT	31.00	NT	123.00	NT		
3.81	SG	1.3	DAY	CR14	SL06	BT	TOX	76.00	NT	0.18	TX		
3.81	SG	1.3	DAY	HA28	SL06	BT	TOX	78.70	TX	0.58	NT		
3.81	NE	.	DAY	HS28	SL06	BT	NOT	98.00	NT	4.24	NT		
3.81	SG	1.3	DAY	TT28	SL06	BT	TOX	19.00	TX	131.00	NT		
4.30	NE	.	JFLD	CT14	1111-02-AS05-01	BT	NOT	75.00	NT	5.06	NT		
4.40	NE	.	DAY	CR14	VS07	BT	NOT	78.70	NT	0.29	NR		
4.40	SG	1.5	DAY	HA28	VS07	BT	TOX	0.00	TX	0.00	NR		
4.40	SG	1.6	DAY	HS28	VS07	BT	TOX	4.00	TX	-0.08	TX		
4.40	SG	1.5	DAY	TT28	VS07	BT	TOX	24.00	TX	7.00	TX		
4.45	NE	.	DAY	CR14	CM08	BT	NOT	85.30	NT	0.42	NT		
4.45	NE	.	DAY	HA28	CM08	BT	NOT	93.30	NT	0.67	NT		
4.45	NE	.	DAY	HS28	CM08	BT	NOT	100.00	NT	5.42	NT		
4.45	NE	.	DAY	TT28	CM08	BT	NOT	37.00	NT	102.00	NT		
4.50	NC	0.8	SUPRF	HA10	OE02	BT	TOX	3.00	TX	3.20	TX		
4.79	NE	.	DAY	CR14	CM01	BT	NOT	84.00	NT	0.31	NT		
4.79	NE	.	DAY	HA28	CM01	BT	NOT	89.30	NT	0.56	NT		
4.79	NE	.	DAY	HS28	CM01	BT	NOT	96.00	NT	5.07	NT		
4.79	NE	.	DAY	TT28	CM01	BT	NOT	34.00	NT	102.00	NT		
5.00	NE	.	SUPRF	HA10	OE27	BT	NOT	90.00	NT	3.87	NT		
5.50	NC	0.9	SUPRF	HA10	MA04	BT	TOX	76.70	TX	0.16	NT		
7.00	SG	1.2	SUPRF	HA10	MA01	BT	TOX	0.00	TX	NR			

7.10	SG	1.2	SUPRF	HA10	MA03	BT	TOX	10.00	TX	.	NR
7.10	SG	1.2	SUPRF	HA10	OE23	BT	TOX	0.00	TX	.	NR
7.30	NE	.	DAY	CR14	CM06	BT	NOT	78.90	NT	0.40	NT
7.30	NE	.	DAY	HA28	CM06	BT	NOT	97.30	NT	0.63	NT
7.30	NE	.	DAY	HS28	CM06	BT	NOT	100.00	NT	6.54	NT
7.30	NE	.	DAY	TT28	CM06	BT	NOT	45.00	NT	96.00	NT
7.70	NE	.	SUPRF	HA10	OE16	BT	NOT	98.00	NT	4.27	NT
8.90	SG	1.5	SUPRF	HA10	OE24	BT	TOX	13.00	TX	3.63	TX
9.10	NE	.	SUPRF	HA10	MA08	BT	NOT	86.70	NT	0.14	NT
9.40	SG	1.6	SUPRF	HA10	OE12	BT	TOX	10.00	TX	3.43	TX
9.50	NE	.	SUPRF	HA10	MA11	BT	NOT	90.00	NT	0.16	NT
10.00	NE	.	SUPRF	HA10	MA10	BT	NOT	78.30	NT	0.14	NT
12.00	*	2.0	SUPRF	HA10	OE25	BT	TOX	0.00	TX	.	NR
14.00	NE	.	SUPRF	HA10	OE14	BT	NOT	96.00	NT	4.98	NT

Appendix 6 Other published sediment effect concentrations (SECs; dry-weight concentrations) used to evaluate the comparability of our calculated SECs. See Appendix 2c for a description of the chemical name for each abbreviated CHEM CODE (ND = not determined).

<u>CODES</u>	<u>UNITS*</u>	<u>SOURCE</u>
ERL	ng/g	Long et al. (1995)
ERM	ng/g	Long et al. (1995)
TELm	ng/g	MacDonald et al. (1995) marine
PELm	ng/g	MacDonald et al. (1995) marine
AET1	ng/g	Barrick et al. (1988) amphipod marine
AET2	ng/g	Barrick et al. (1988) oysters marine
AET3	ng/g	Barrick et al. (1988) microtox marine
AET4	ng/g	Barrick et al. (1988) benthos marine
SLC1	ng/g	Persaud et al. (1992) lowest effect level
SLC2	ng/g	Persaud et al. (1992) severe effect level (assumed 2% total organic carbon; TOC)
EQP	ng/g	USEPA (1988) and more recent (assume 2% TOC)
TELf	ng/g	Smith et al. (1996) freshwater
PELf	ng/g	Smith et al. (1996) freshwater
AET5	ng/g	Batts and Cubbage (1995) Hyalella freshwater (assumed 2% TOC for PAHs and PCBs)
AET6	ng/g	Batts and Cubbage (1995) Microtox freshwater (assumed 2% TOC for PAHs and PCBs)

*metals: ug/g

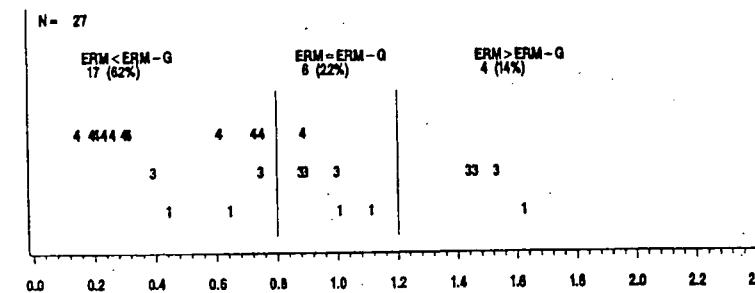
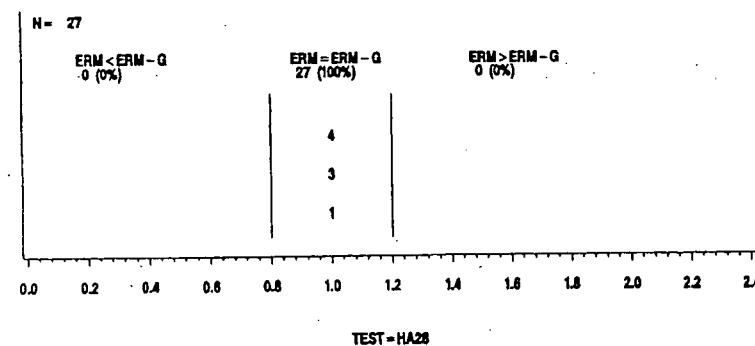
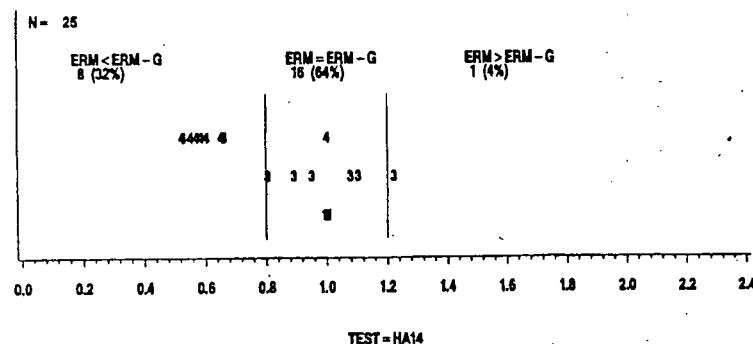
*iron: percent

ND = not determined

<u>CHEM CODE</u>	<u>ERL</u>	<u>ERM</u>	<u>TELm</u>	<u>PELm</u>	<u>AET1</u>	<u>AET2</u>	<u>AET3</u>	<u>AET4</u>	<u>SLC1</u>	<u>SLC2</u>	<u>EOP</u>	<u>TElf</u>	<u>PElf</u>	<u>AET5</u>	<u>AET6</u>
SILVER	1.0	3.7	0.73	1.77	6.1	0.56	6.1	0.56	ND	ND	ND	ND	ND	4.5	ND
ARSENIC	8.2	70	7.24	41.6	93	700	57	700	6	33	ND	5.9	17	150	40
CADMIUM	1.2	9.6	0.68	4.21	6.7	9.6	5.1	9.6	0.6	10	ND	0.596	3.53	12	7
CHROMIUM-T	81	370	52.3	160	270	ND	260	ND	26	110	ND	37.3	90	280	ND
COPPER	34	270	18.7	108	1300	390	530	390	16	110	ND	35.7	197	840	ND
IRON	ND	ND	ND	ND	ND	ND	ND	ND	2	4	ND	ND	ND	ND	ND
MERCURY 0.15	0.71	0.13	0.7	2.1	0.59	2.1	0.41	0.2	2	ND	0.147	0.486	2.7	0.56	
MANGANESE	ND	ND	ND	ND	ND	ND	ND	ND	460	1100	ND	ND	ND	1800	ND
NICKEL	20.9	51.6	15.9	42.8	140	ND	140	ND	16	75	ND	18	36	ND	31
LEAD	46.7	218	30.2	112	660	660	450	530	31	250	ND	35	91.3	720	260
SELENIUM ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ZINC	150	410	124	271	960	1600	410	1600	120	820	ND	123	315	1100	490
14-2CLBNZ	ND	ND	ND	ND	120	120	110	110	ND	ND	ND	ND	ND	ND	ND
12-2CLBNZ	ND	ND	ND	ND	110	50	50	35	ND	ND	ND	ND	ND	ND	ND
13-2CLBNZ	ND	ND	ND	ND	170	170	170	170	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	160	2100	34.6	391	2400	2100	2700	2100	ND	ND	ND	ND	ND	46000	6600
2-METHNAP	70	670	20.2	201	1900	670	1400	670	ND	ND	ND	ND	ND	ND	ND
ACENA	16	500	6.71	88.9	2000	500	730	500	ND	ND	ND	ND	ND	68000	580
DIBNZFURAN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10200	ND
FLUORENE	19	540	21.2	144	3600	540	1000	540	ND	ND	ND	ND	ND	84000	600
PHENANTHRN	240	1500	86.7	544	6900	1500	5400	1500	ND	ND	2400	41.9	515	182000	2200
ANTHRAACENE	85.3	1100	46.9	245	13000	960	4400	960	ND	ND	ND	ND	ND	34000	520
FLUORANTHN	600	5100	113	1494	30000	2500	24000	1700	ND	ND	20400	111	2355	96000	3000
PYRENE	665	2600	153	1398	16000	3300	16000	2600	ND	ND	26000	53	875	62000	3200
BAA	261	1600	74.8	693	5100	1600	5100	1300	ND	ND	26000	31.7	385	13000	1100
CHRYSENE	384	2800	108	846	9200	2800	9200	1400	ND	ND	ND	57.1	862	34000	1580
BBF	ND	ND	ND	ND	7800	3600	9900	3200	ND	ND	ND	ND	ND	30000	2200
BKF	ND	ND	ND	ND	7800	3600	9900	3200	ND	ND	ND	ND	ND	30000	2200
BAP	430	1600	88.8	763	3000	1600	3600	1600	ND	ND	22000	31.9	782	18200	1580
ICDP	ND	ND	ND	ND	1800	690	2600	600	ND	ND	ND	ND	ND	7600	660
BGHIP	ND	ND	ND	ND	1400	720	2600	670	ND	ND	ND	ND	ND	18200	600
BBKF	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
ACENAPTYLE	44	640	5.87	128	1300	560	1300	560	ND	ND	2800	ND	ND	1660	320
DBA	63.4	260	6.22	135	540	230	970	230	ND	ND	ND	ND	ND	3200	200
PAH-L	552	3160	312	1442	24000	5200	13000	5200	ND	ND	ND	ND	ND	420000	11000
PAH-H	1700	9600	655	6675	69000	17000	69000	12000	ND	ND	ND	ND	ND	220000	13000
PAH-T	4022	44792	1684	16770	ND	ND	ND	ND	2000	220000	ND	34.1	277	640000	24000

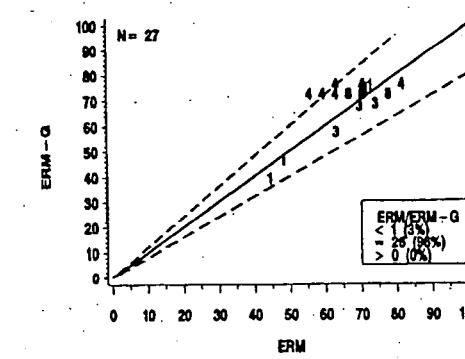
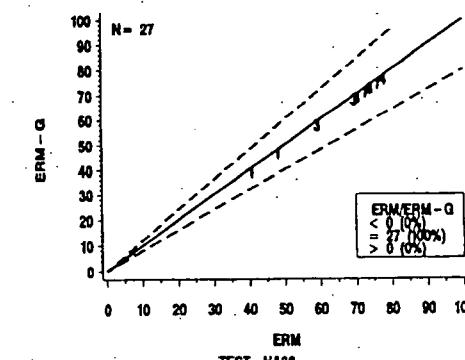
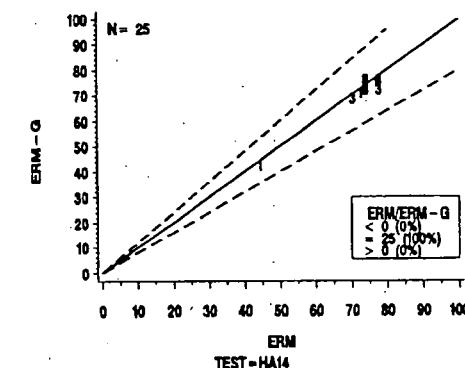
ERM / ERM-G

FIGURE 1A: ENTIRE DATABASE VS GREAT LAKES DATABASE
BY CONCENTRATION
TEST = CR14



ERM / ERM-G

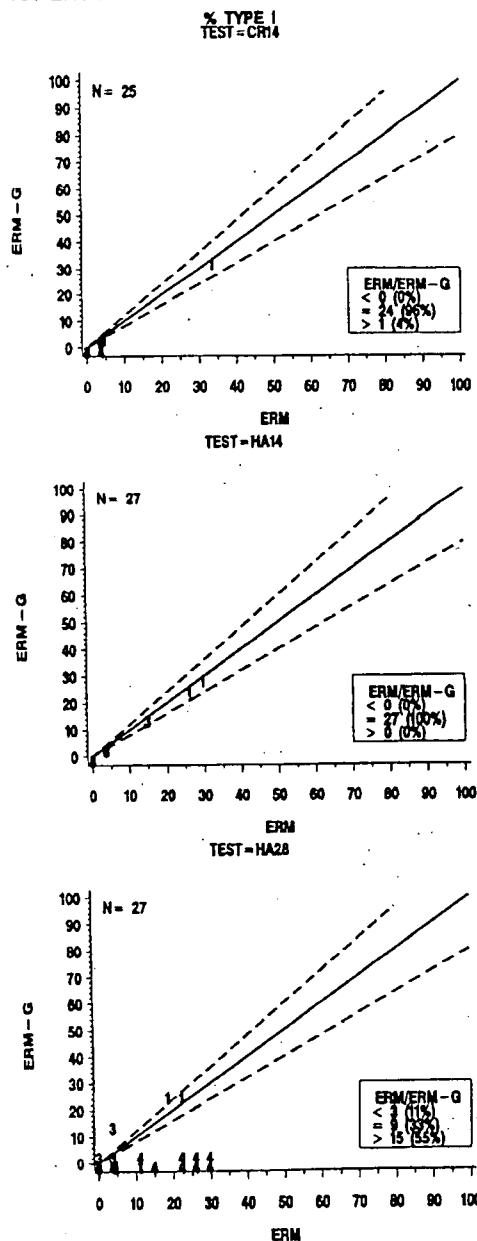
FIGURE 1B: ENTIRE DATABASE VS GREAT LAKES DATABASE
% CORRECT
TEST = CR14



Figures 1a and 1b. Comparability and reliability of ERMs calculated using the Great Lakes database (ERM-G) vs ERMs calculated using dry-weight concentrations and the entire database (ERM). See the page preceding Figure 1 in the report for additional detail.

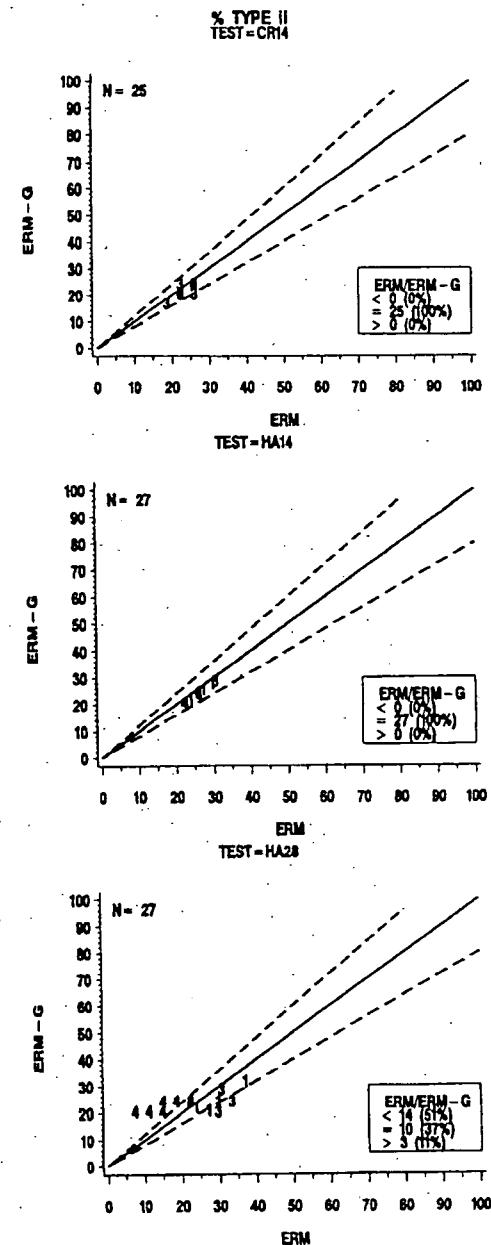
ERM / ERM-G

FIGURE 1C: ENTIRE DATABASE VS GREAT LAKES DATABASE



ERM / ERM-G

FIGURE 1D: ENTIRE DATABASE VS GREAT LAKES DATABASE



Figures 1c and 1d. Comparability and reliability of ERMs calculated using the Great Lakes database (ERM-G) vs ERMs calculated using dry-weight concentrations and the entire database (ERM). See the page proceeding Figure 1 in the report for additional detail.

FIGURE 2A: ENTIRE DATABASE VS GREAT LAKES DATABASE
BY CONCENTRATION TEST-CRIM

% CORRECT

TEST-CRIM

FIGURE 2B: ENTIRE DATABASE VS GREAT LAKES DATABASE

PEL / PEL-G

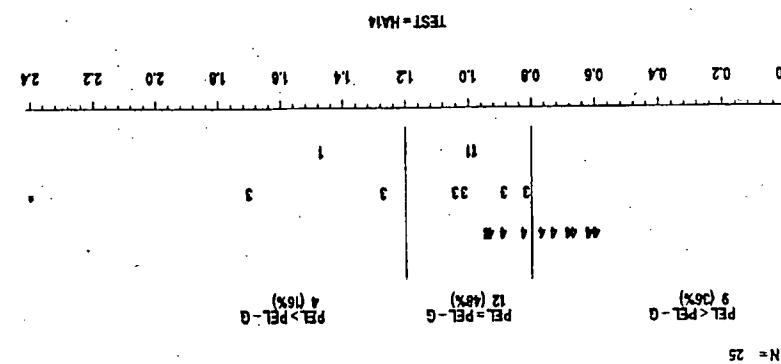
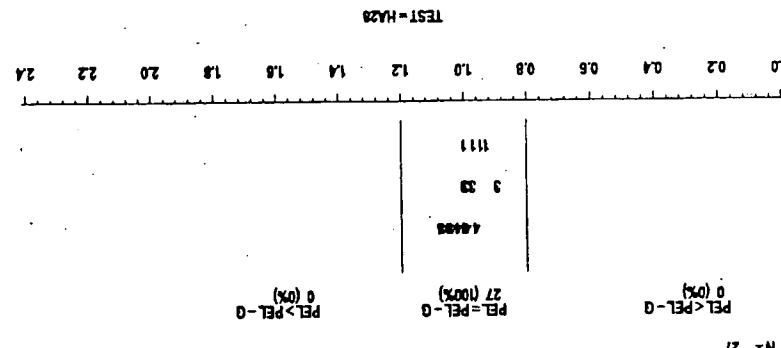
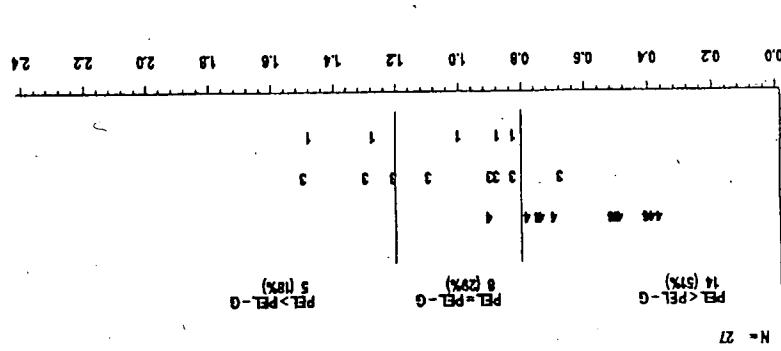
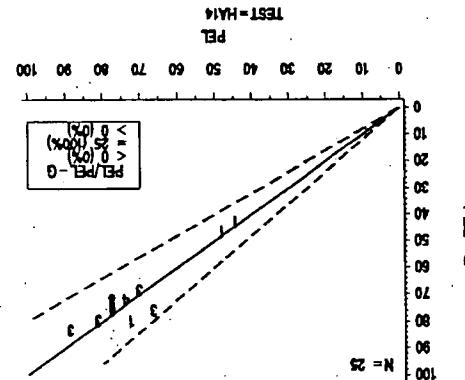
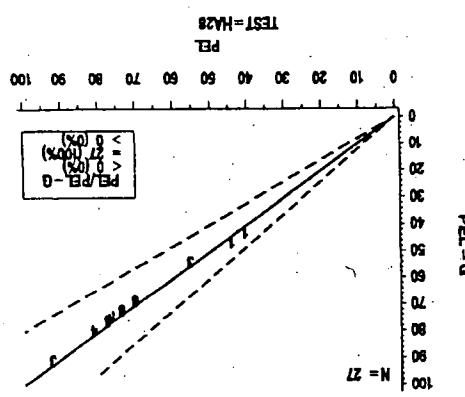
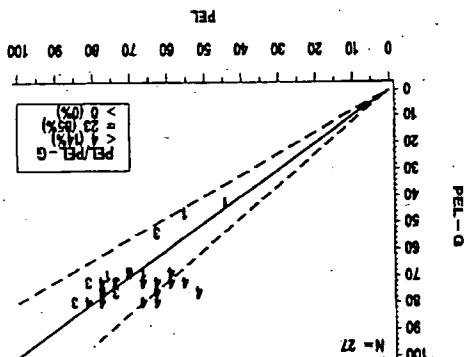


FIGURE 2B: ENTIRE DATABASE VS GREAT LAKES DATABASE
BY CONCENTRATION TEST-CRIM

Page proceeding Figure 1 in the report for additional detail.

Figures 2c and 2d. Comparability and reliability of PELs calculated using the Great Lakes database (PEL-G) vs PELs calculated using dry-weight concentrations and the entire database (PEL). See the

FIGURE 2D: ENTIRE DATABASE VS GREAT LAKES DATABASE

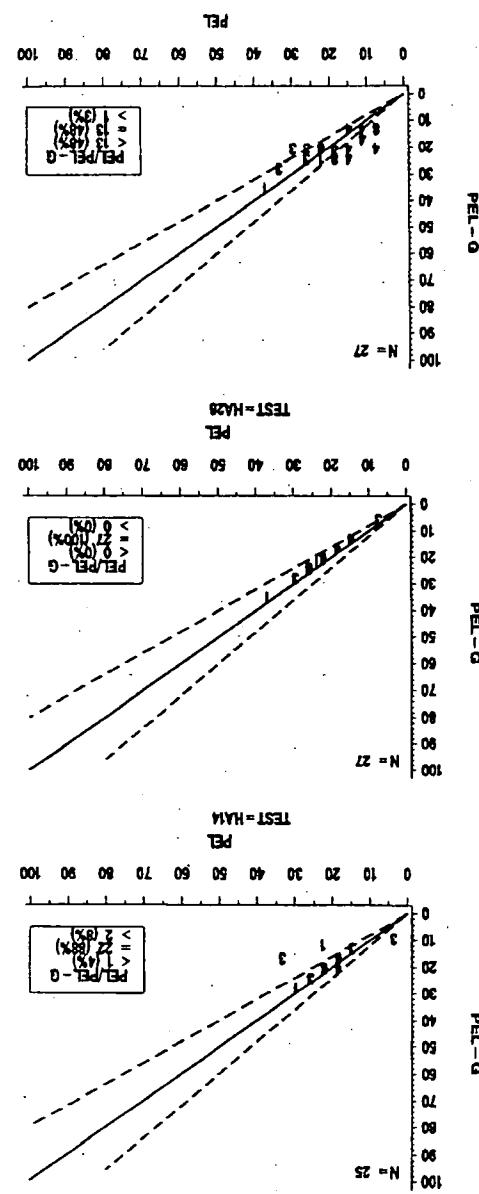
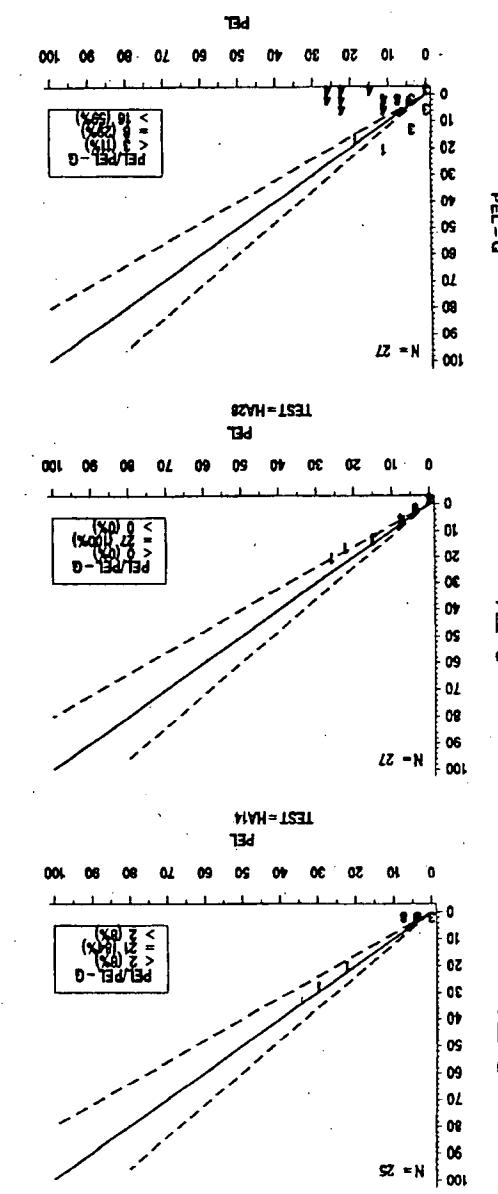


FIGURE 2C: ENTIRE DATABASE VS GREAT LAKES DATABASE



PEL / PEL-G

PEL / PEL-G

ERL / ERL-G

FIGURE 3A: ENTIRE DATABASE VS GREAT LAKES DATABASE
BY CONCENTRATION TEST=CR4

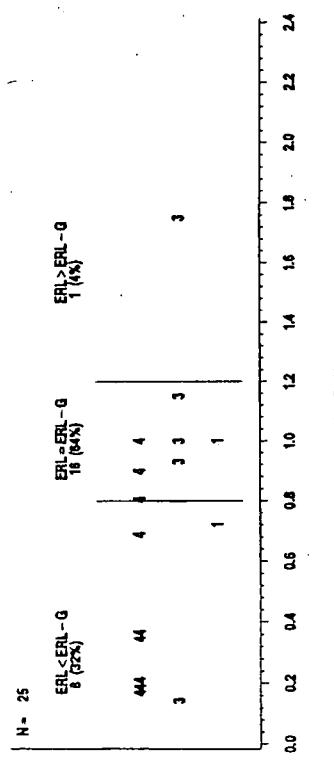
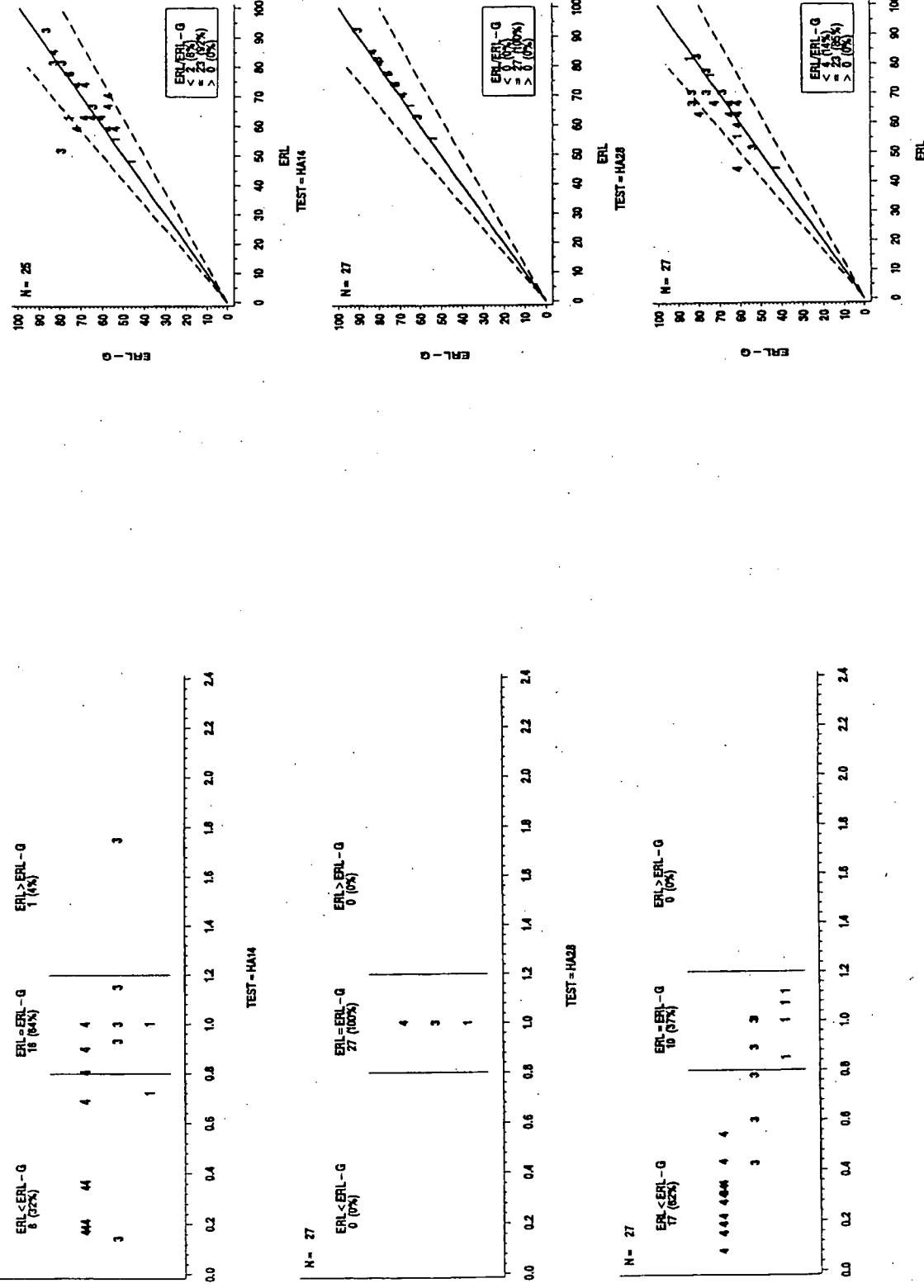


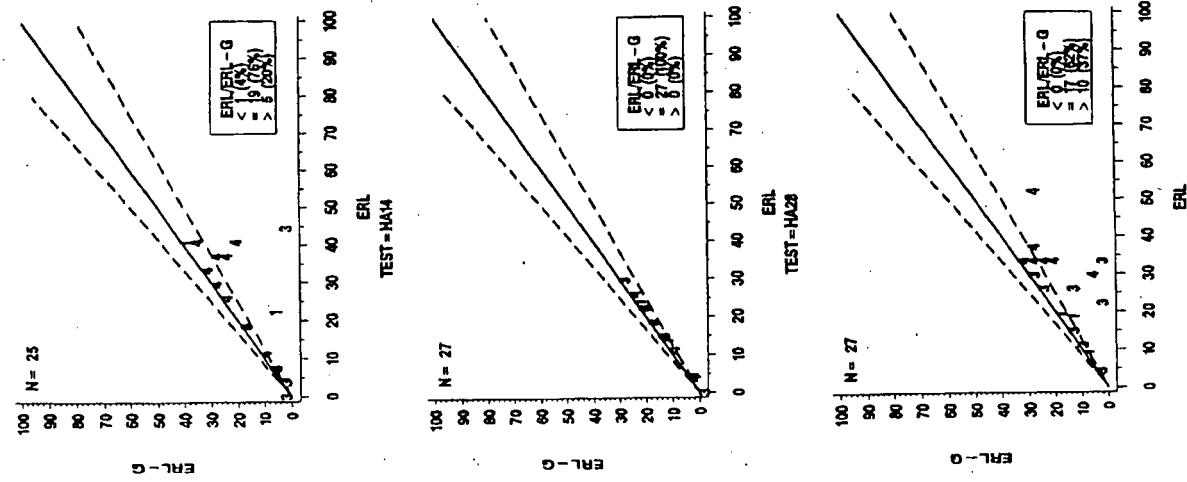
FIGURE 3B: ENTIRE DATABASE VS GREAT LAKES DATABASE
% CORRECT TEST=CR4



Figures 3a and 3b. Comparability and reliability of ERLs calculated using the Great Lakes database (ERL-G) vs ERLs calculated using dry-weight concentrations and the entire database (ERL). See the page preceding Figure 1 in the report for additional detail.

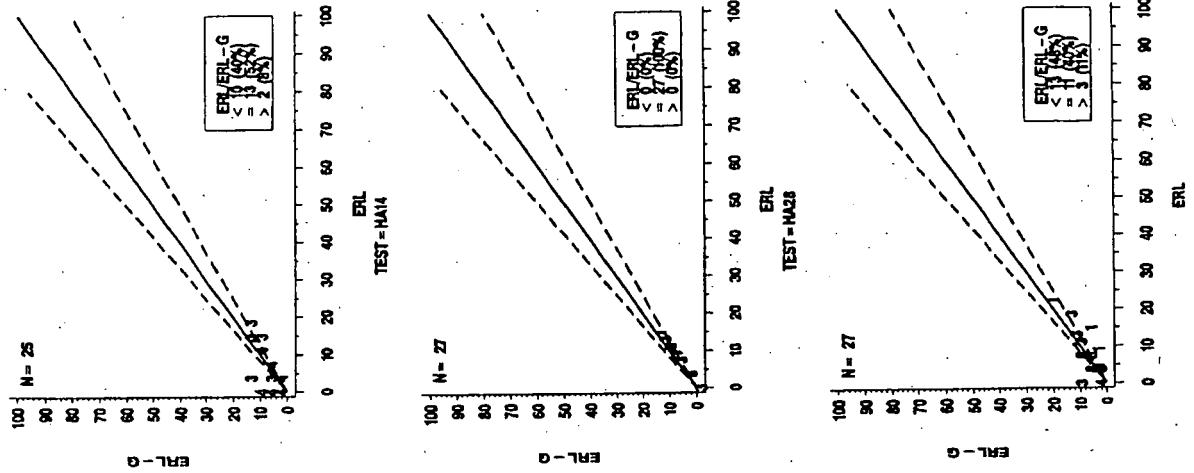
ERL / ERL-G

FIGURE 3C: ENTIRE DATABASE VS GREAT LAKES DATABASE
% TYPE I
TEST=CR4



ERL / ERL-G

FIGURE 3D: ENTIRE DATABASE VS GREAT LAKES DATABASE
% TYPE II
TEST=CR4

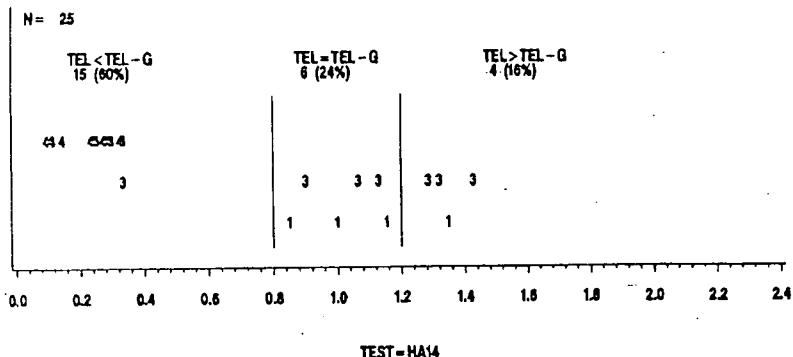


Figures 3c and 3d. Comparability and reliability of ERLs calculated using the Great Lakes database (ERL-G) vs ERLs calculated using dry-weight concentrations and the entire database (ERL). See the

TEL / TEL-G

FIGURE 4A: ENTIRE DATABASE VS GREAT LAKES DATABASE

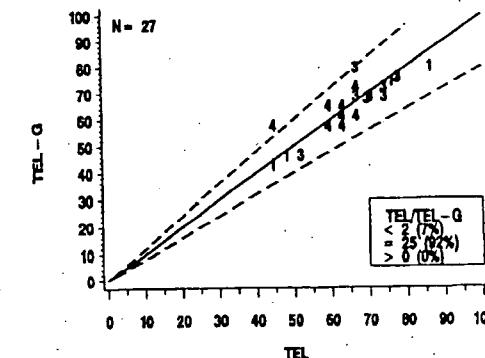
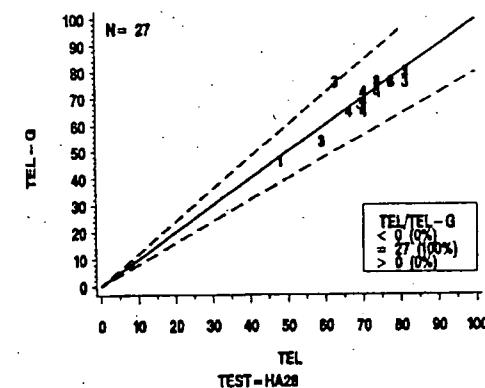
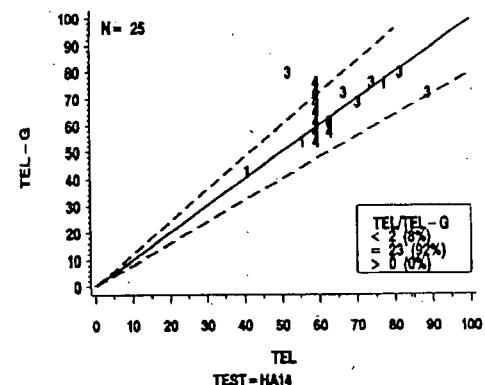
BY CONCENTRATION
TEST=CR14



TEL / TEL-G

FIGURE 4B: ENTIRE DATABASE VS GREAT LAKES DATABASE

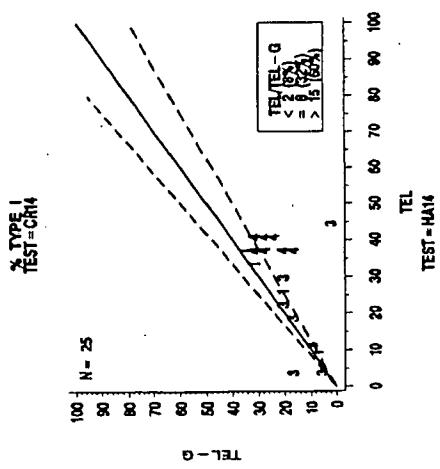
% CORRECT
TEST=CR14



Figures 4a and 4b. Comparability and reliability of TELs calculated using the Great Lakes database (TEL-G) vs TELs calculated using dry-weight concentrations and the entire database (TEL). See the page preceding Figure 1 in the report for additional detail.

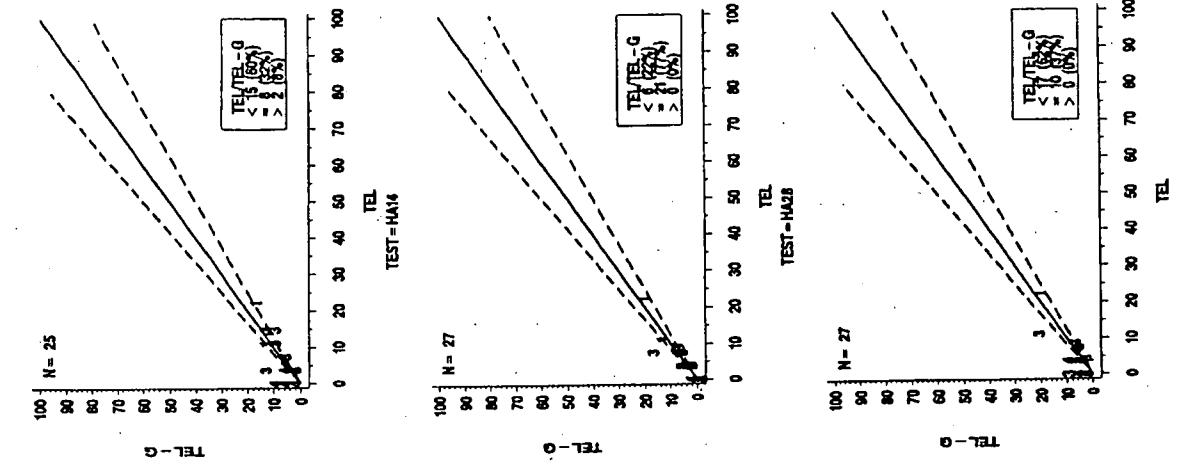
TEL / TEL-G

FIGURE 4C: ENTIRE DATABASE VS GREAT LAKES DATABASE



TEL / TEL-G

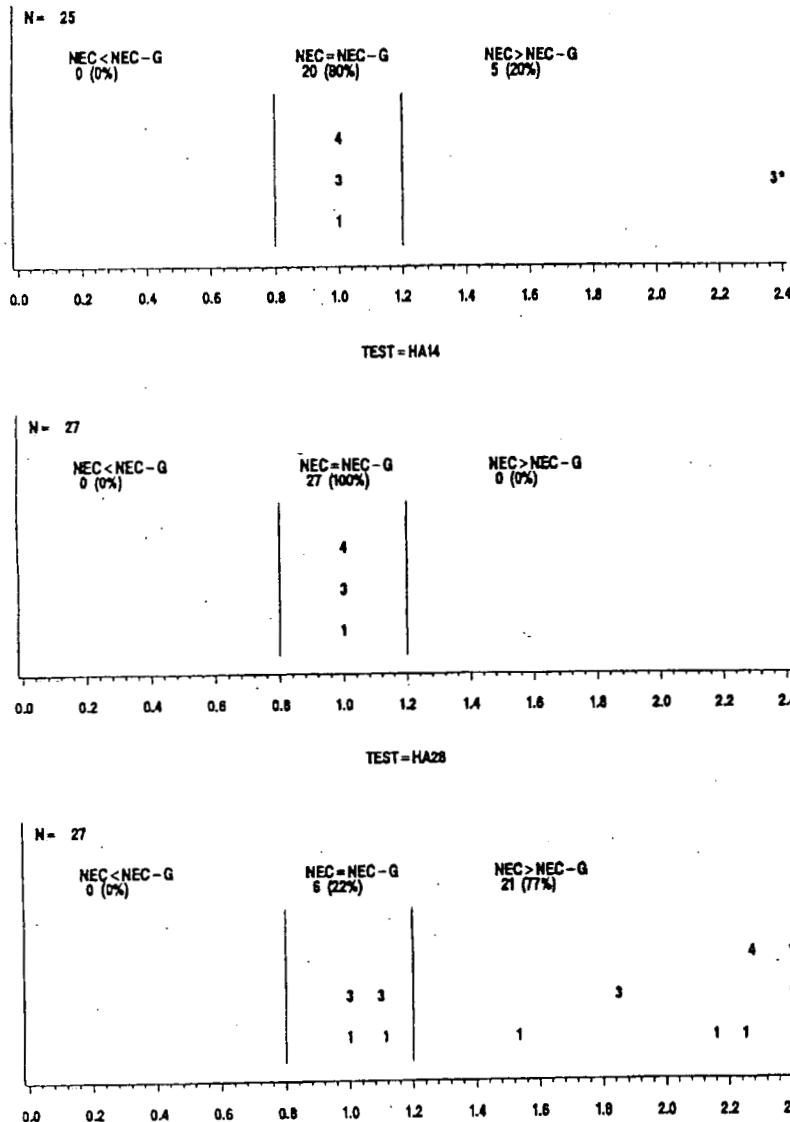
FIGURE 4D: ENTIRE DATABASE VS GREAT LAKES DATABASE
TEST = CH4



Figures 4c and 4d. Comparability and reliability of TEIs calculated using the Great Lakes database (TEL-G) vs TEIs calculated using dry-weight concentrations and the entire database (TEL). See the page proceeding Figure 1 in the report for additional detail.

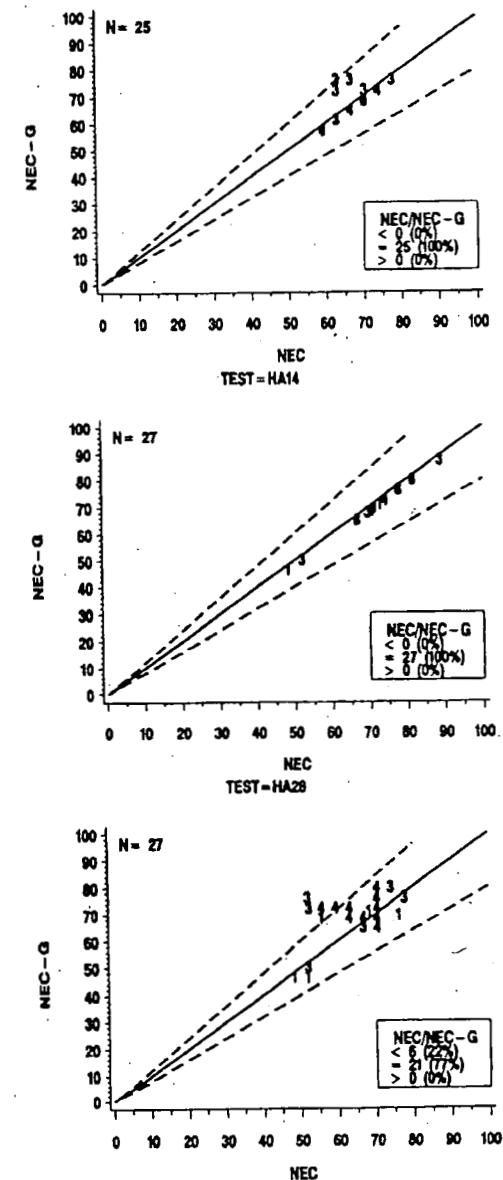
NEC / NEC-G

FIGURE 5A: ENTIRE DATABASE VS GREAT LAKES DATABASE
BY CONCENTRATION
TEST=CR14



NEC / NEC-G

FIGURE 5B: ENTIRE DATABASE VS GREAT LAKES DATABASE
% CORRECT
TEST=CR14

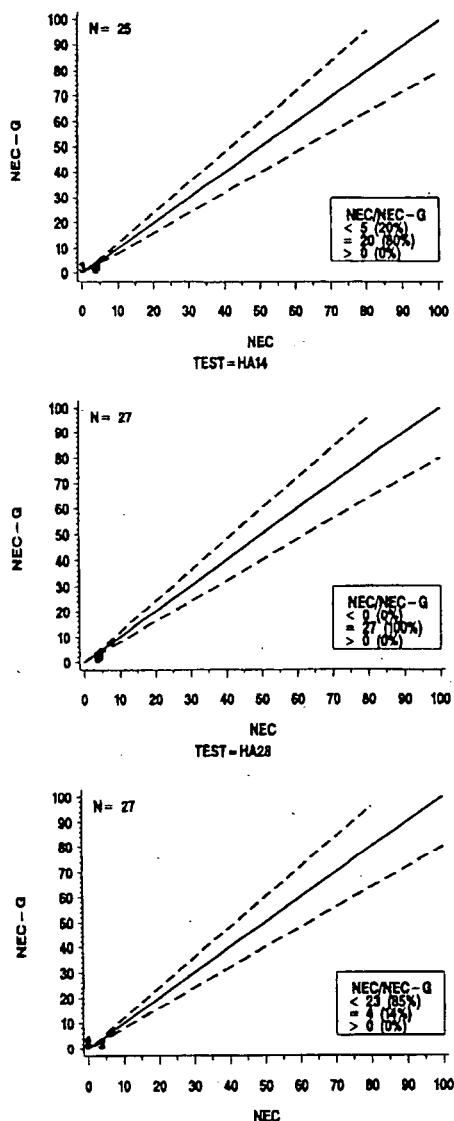


Figures 5a and 5b. Comparability and reliability of NECs calculated using the Great Lakes database (NEC-G) vs NECs calculated using dry-weight concentrations and the entire database (NEC). See the accompanying Figure 1 in the report for additional detail.

NEC / NEC-G

FIGURE 5C: ENTIRE DATABASE VS GREAT LAKES DATABASE

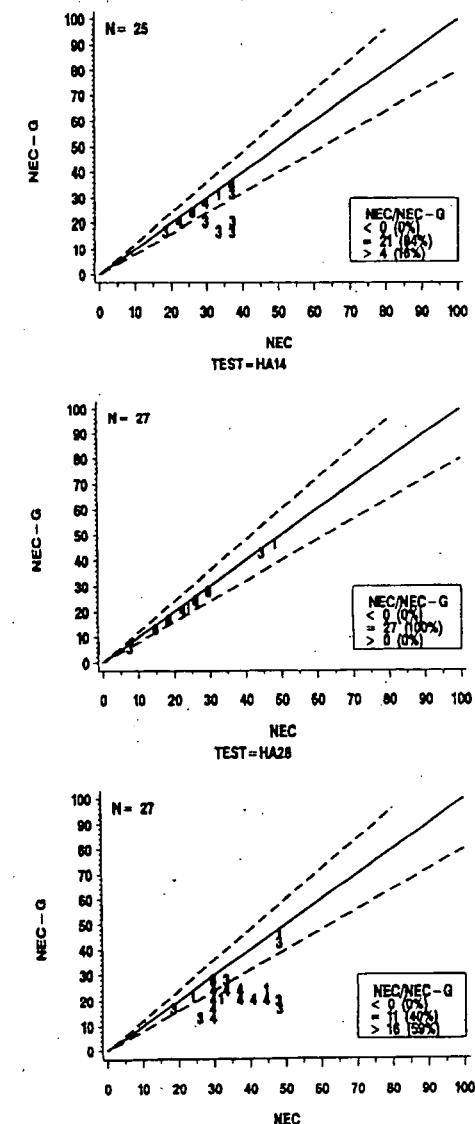
% TYPE I
TEST = CR4



NEC / NEC-G

FIGURE 5D: ENTIRE DATABASE VS GREAT LAKES DATABASE

X TYPE II
TEST = CR4

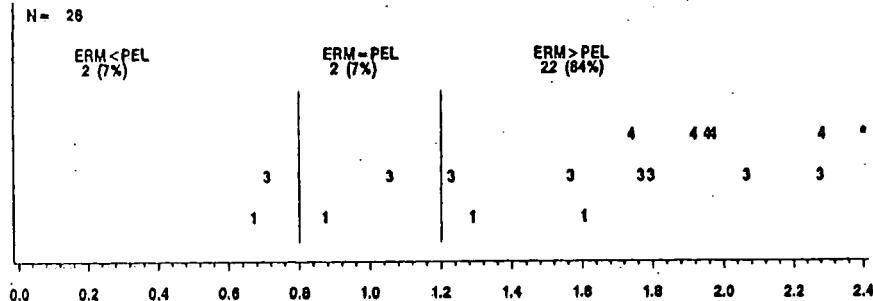


Figures 5c and 5d. Comparability and reliability of NECs calculated using the Great Lakes database (NEC-G) vs NECs calculated using dry-weight concentrations and the entire database (NEC). See the page preceding Figure 1 in the report for additional detail.

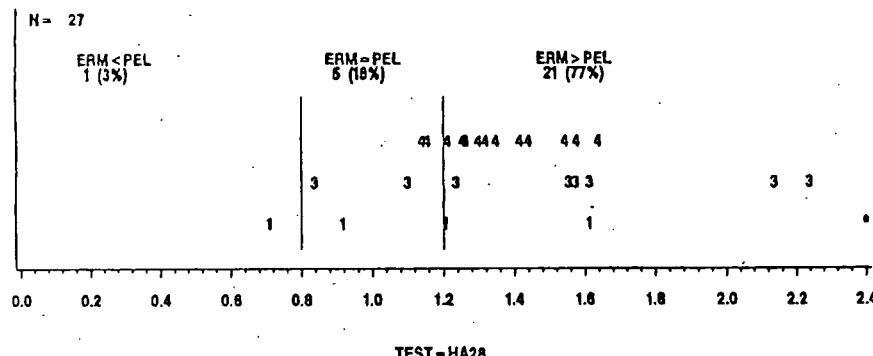
ERM / PEL

FIGURE 6A: BY CONCENTRATION

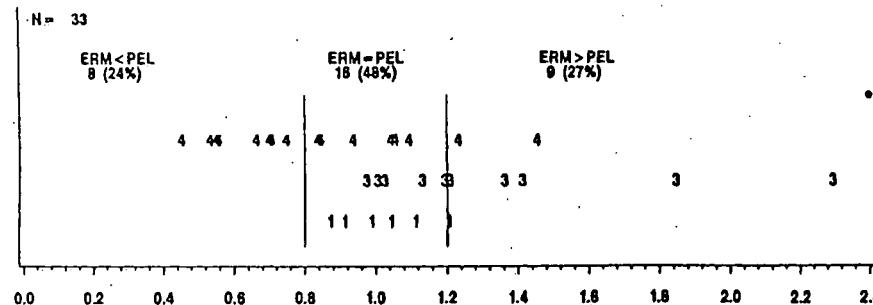
TEST = CR14



TEST = HA14



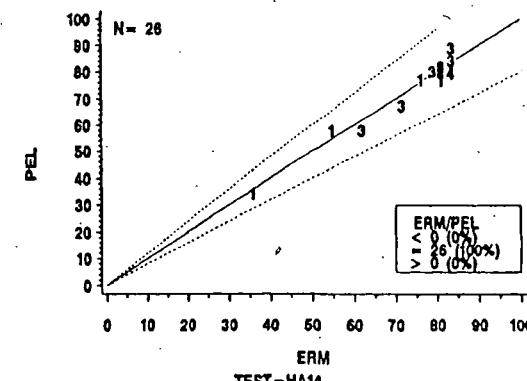
TEST = HA28



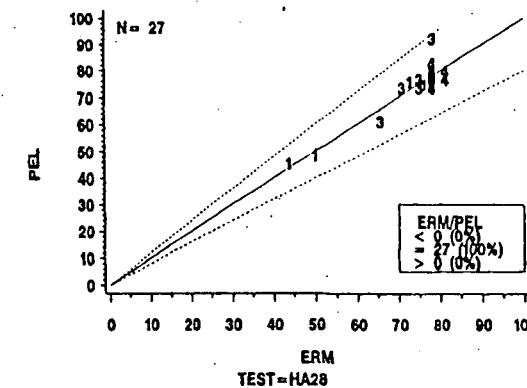
ERM / PEL

FIGURE 6B: % CORRECT

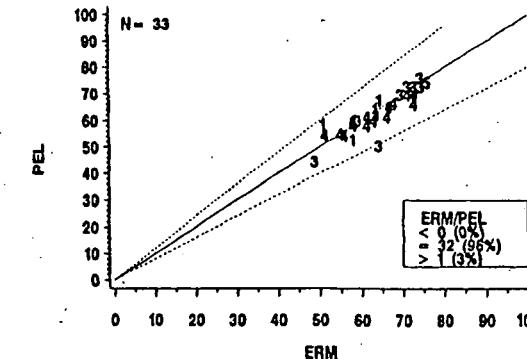
TEST = CR14



TEST = HA14



TEST = HA28

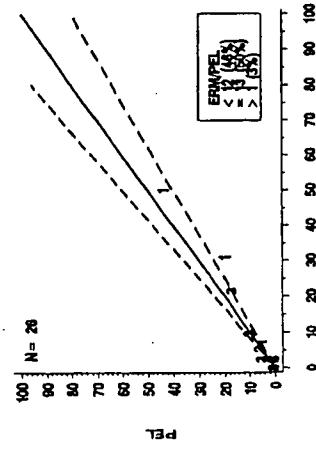


Figures 6a and 6b. Comparability and reliability of ERMs and PELs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

ERM / PEL

FIGURE 6C: % TYPE I

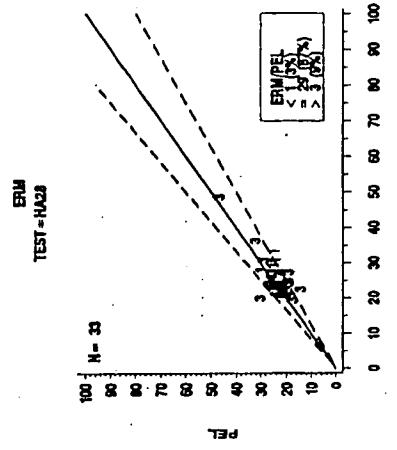
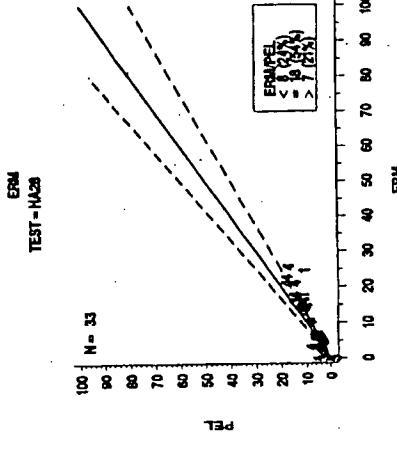
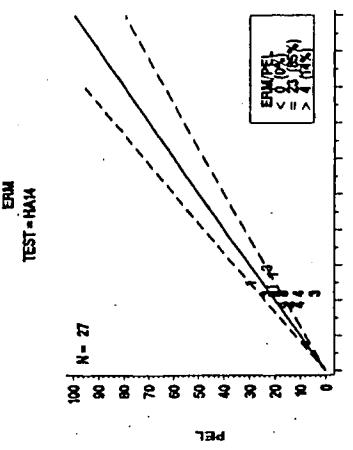
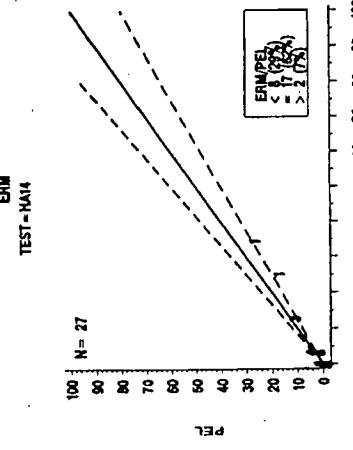
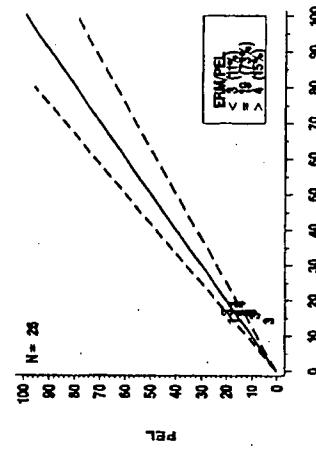
TEST = CRI4



ERM / PEL

FIGURE 6D: % TYPE II

TEST = CRI4

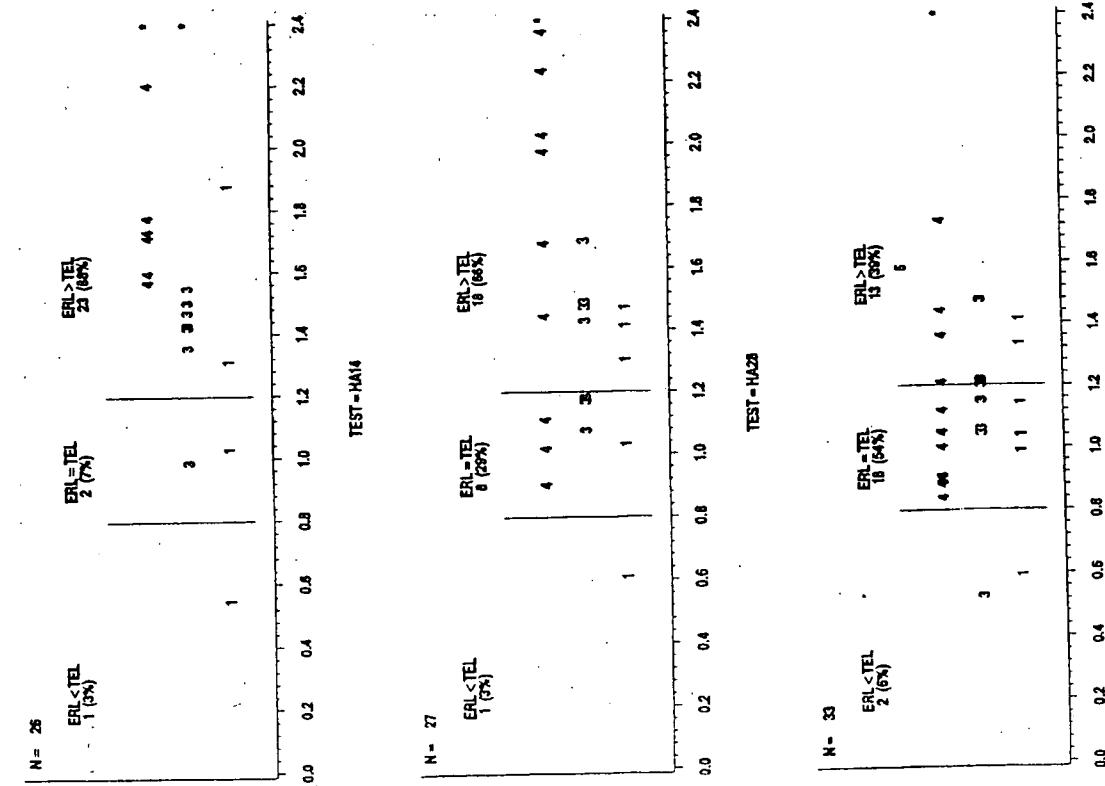


Figures 6c and 6d. Comparability and reliability of ERMs and PELs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

ERL / TEL

FIGURE 7A: BY CONCENTRATION

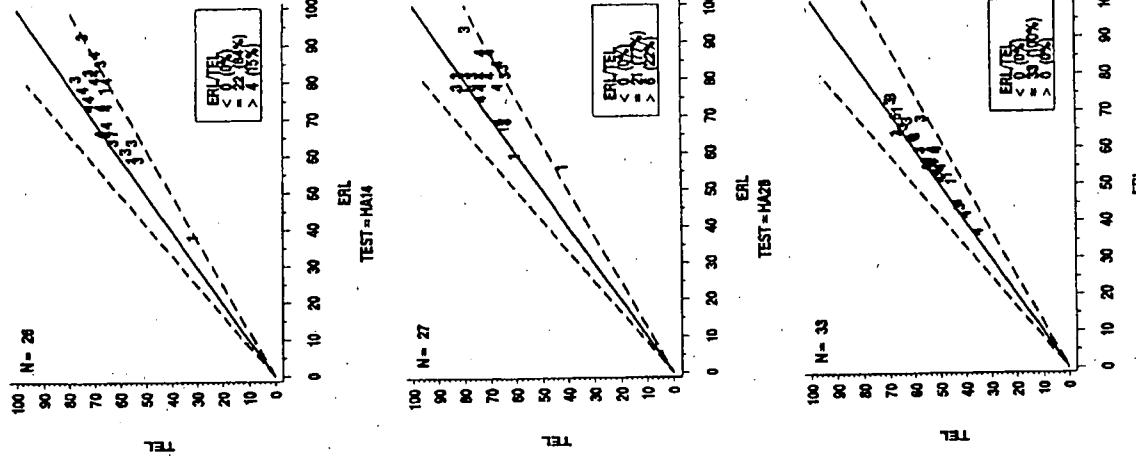
TEST = CR4



ERL / TEL

FIGURE 7B: % CORRECT

TEST = CR4

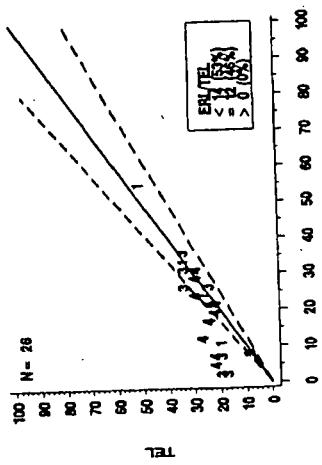


Figures 7a and 7b. Comparability and reliability of ERL's and TEL's calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

ERL / TEL

FIGURE 7C: % TYPE I

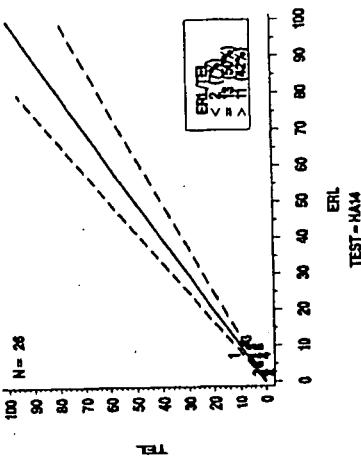
TEST = CRI4



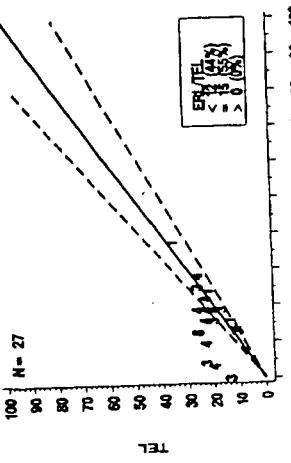
ERL / TEL

FIGURE 7D: % TYPE II

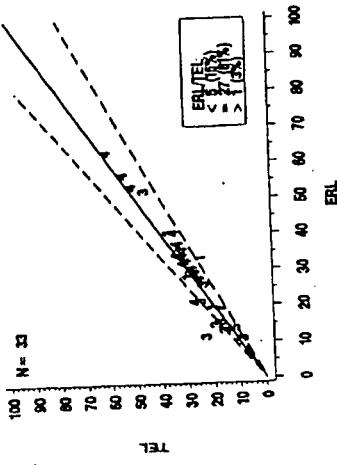
TEST = CRI4



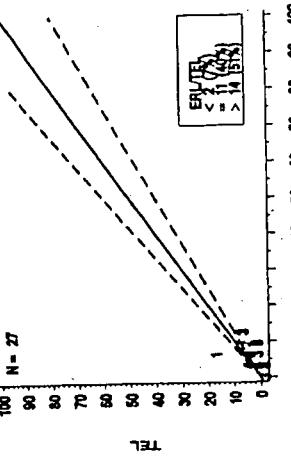
TEST = HAA4



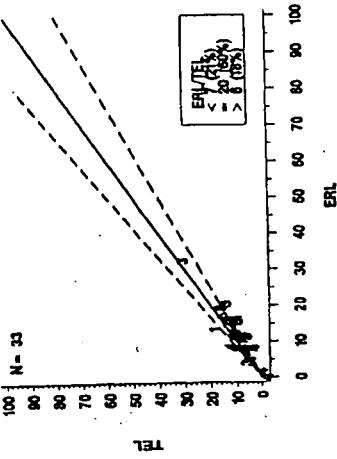
TEST = HAA28



TEST = HAA4



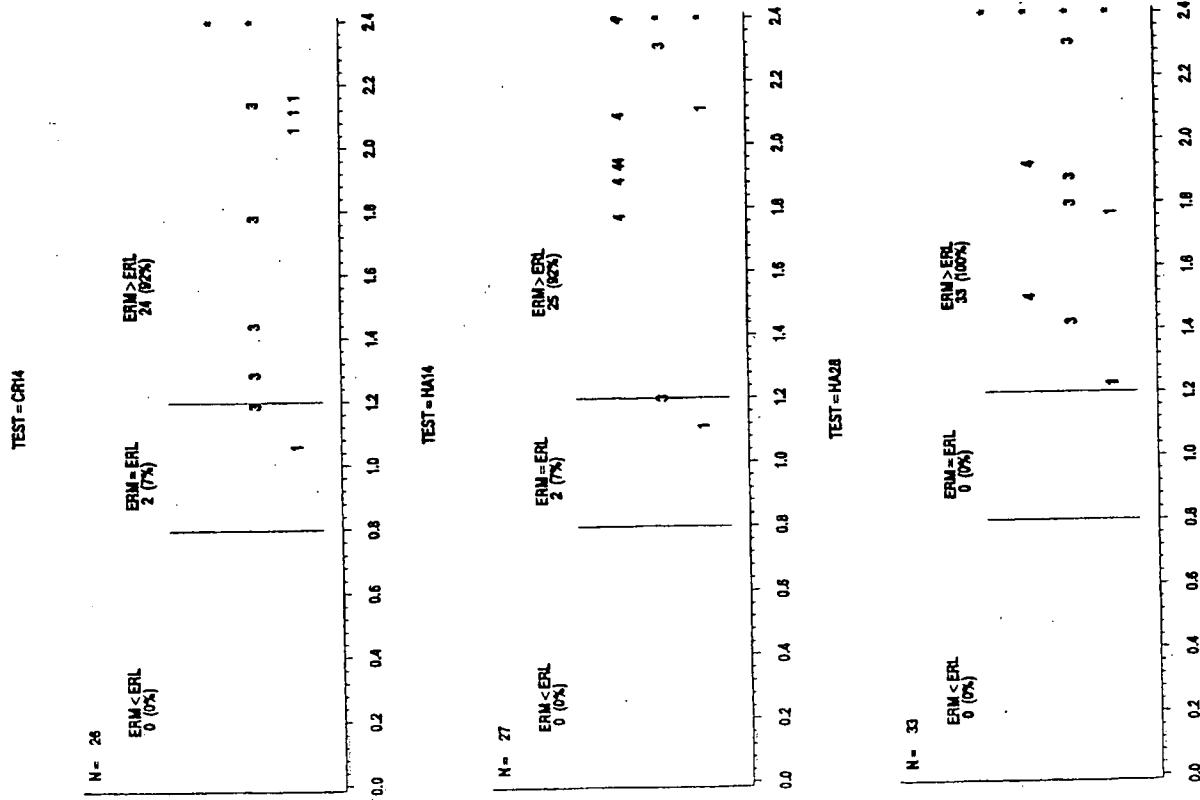
TEST = HAA28



Figures 7c and 7d. Comparability and reliability of ERLs and TELs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

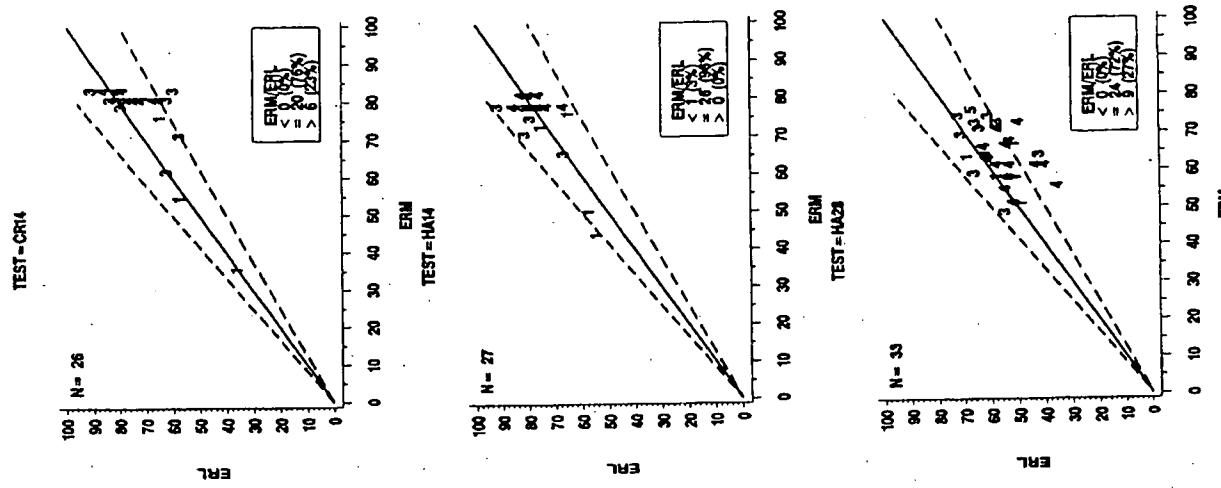
ERM / ERL

FIGURE 8A: BY CONCENTRATION



ERM / ERL

FIGURE 8B: % CORRECT

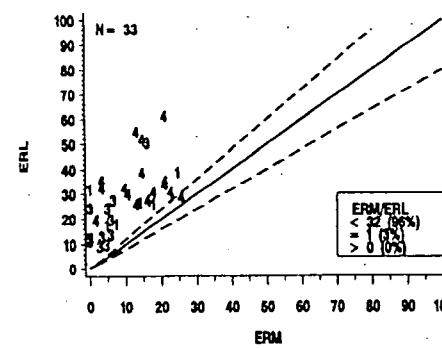
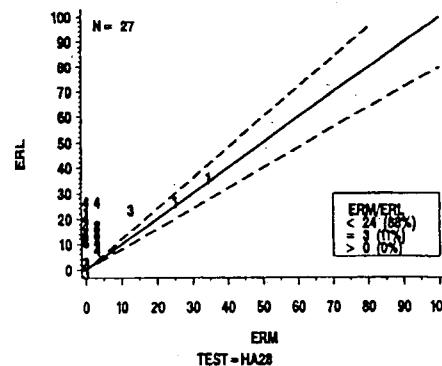
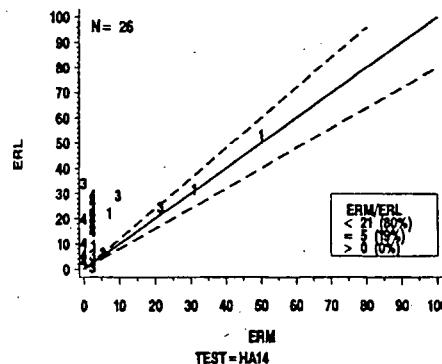


Figures 8a and 8b. Comparability and reliability of ERMs and ERLs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

ERM / ERL

FIGURE 8C: % TYPE I

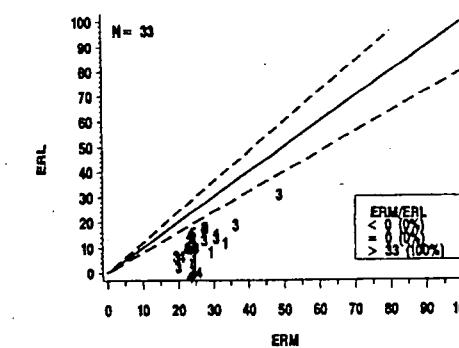
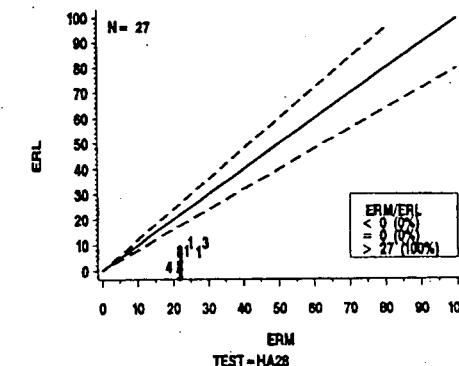
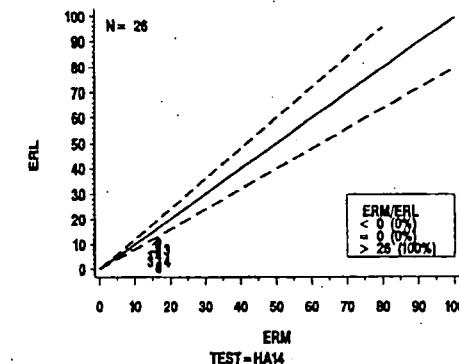
TEST=CR14



ERM / ERL

FIGURE 8D: % TYPE II

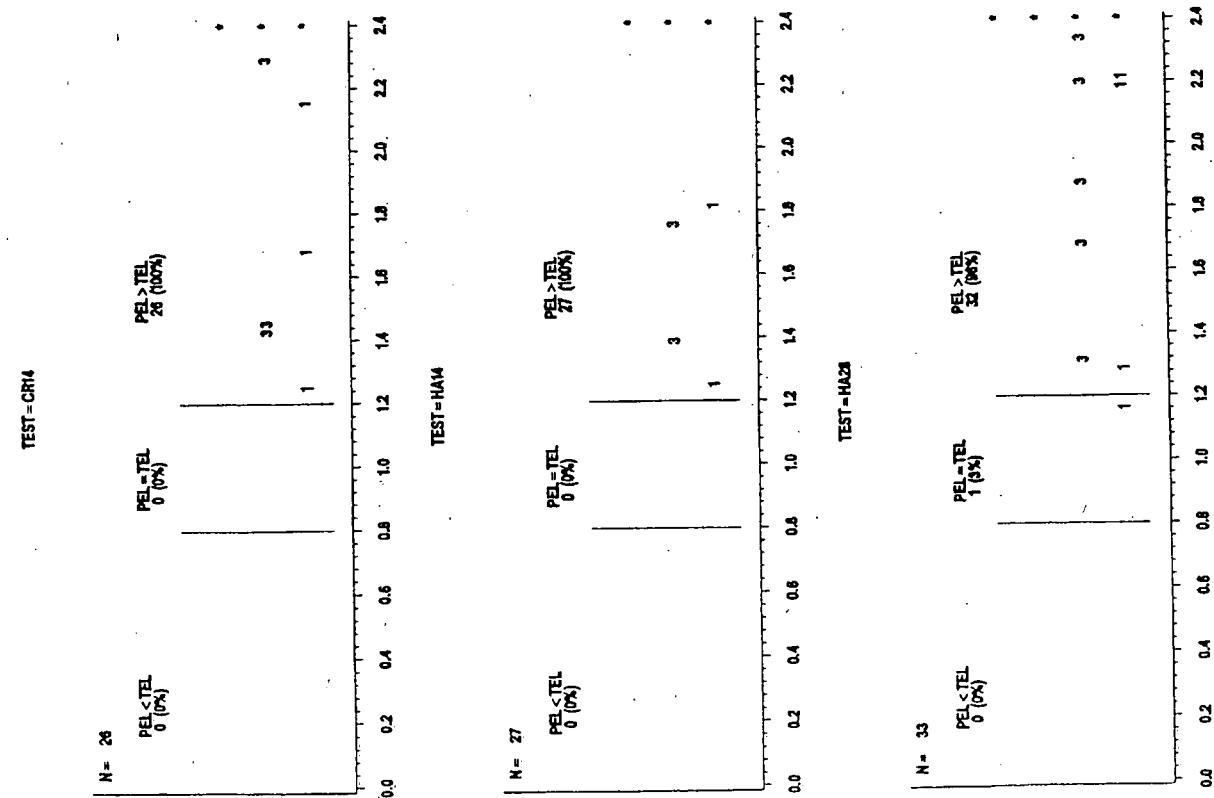
TEST=CR14



Figures 8c and 8d. Comparability and reliability of ERMs and ERLs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

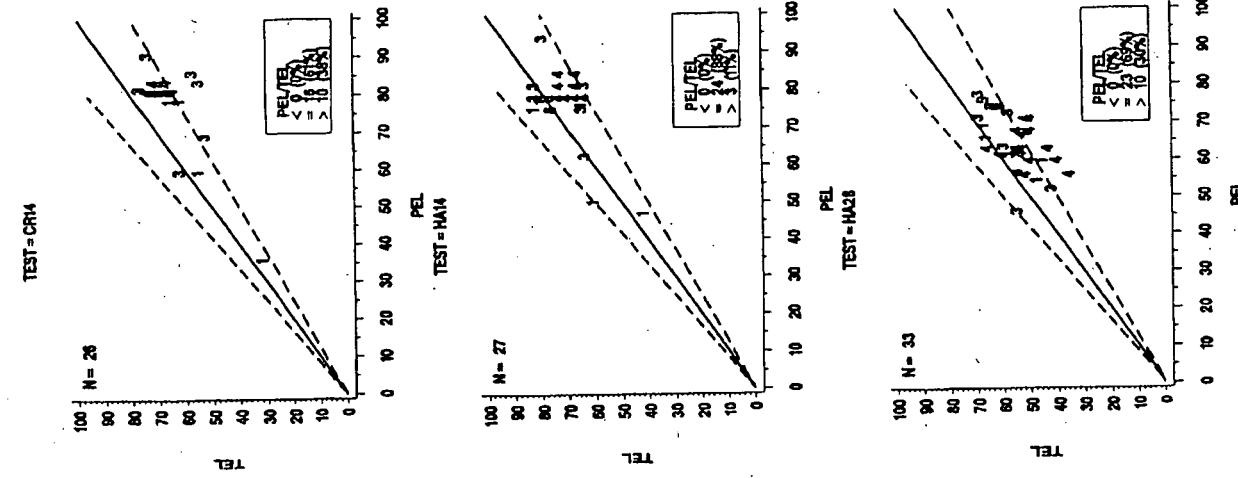
APPEL / TEL

FIGURE 9A: BY CONCENTRATION



PEI / TET

FIGURE 9B: % CORRECT

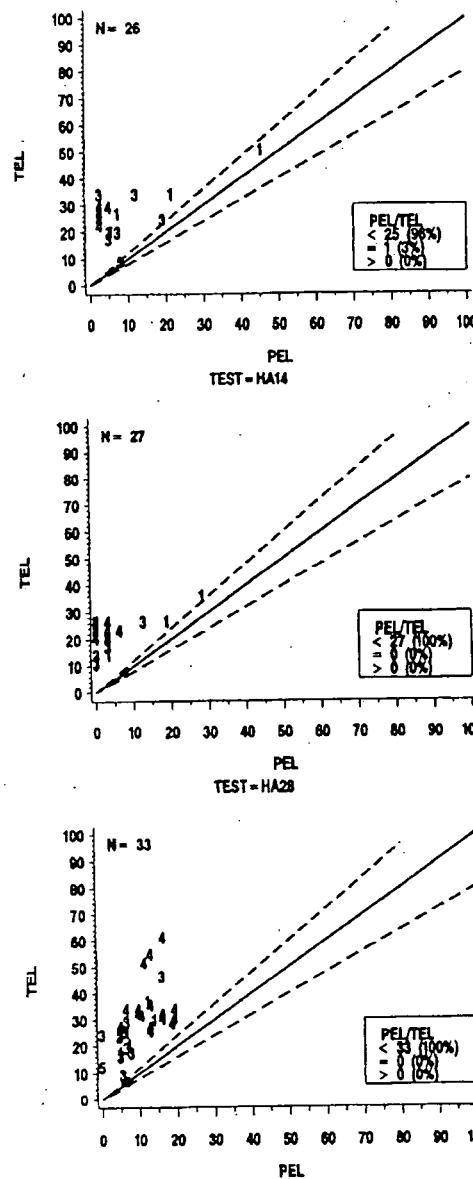


Figures 9a and 9b. Comparability and reliability of PELs and TELs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

PEL / TEL

FIGURE 9C: % TYPE I

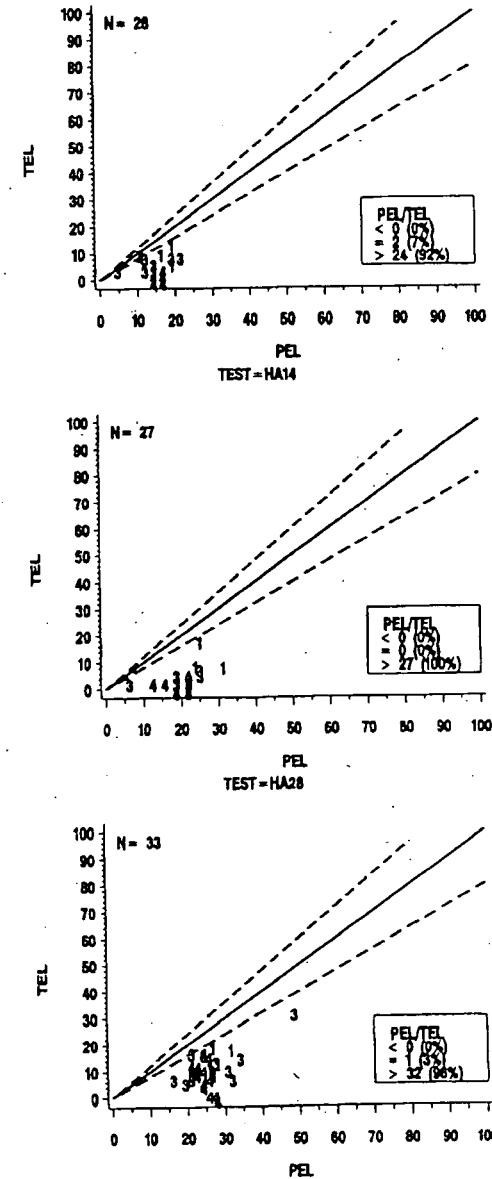
TEST = CR14



PEL / TEL

FIGURE 9D: % TYPE II

TEST = CR14

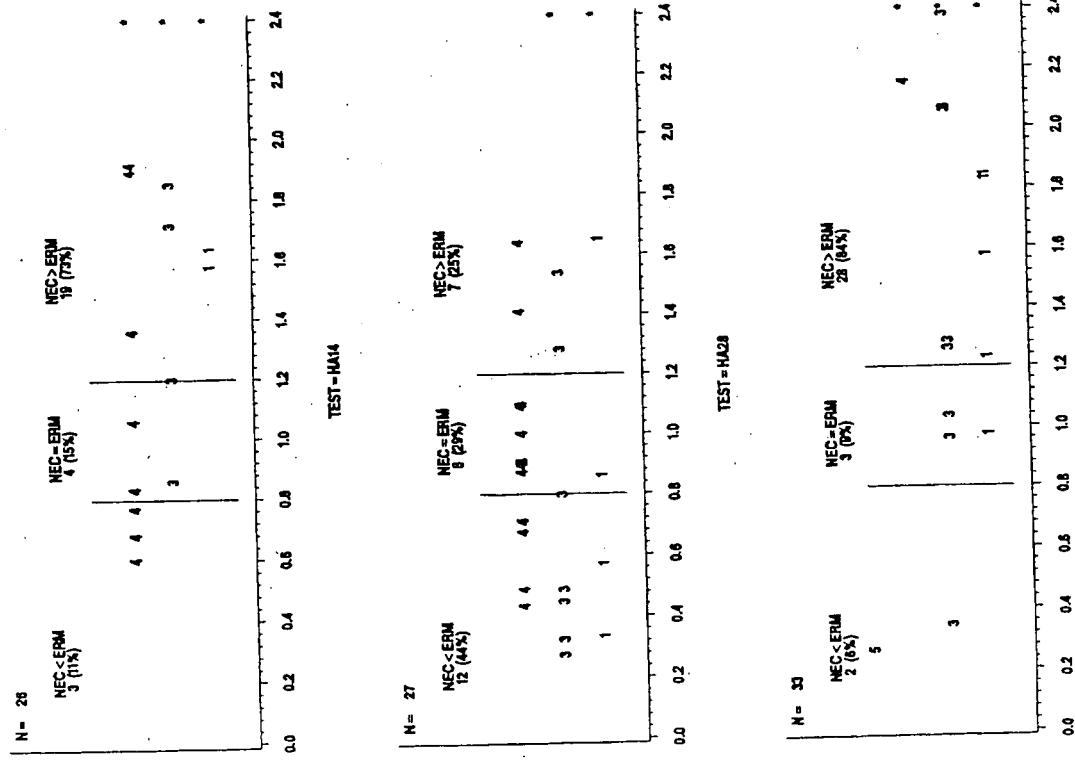


Figures 9c and 9d. Comparability and reliability of PELs and TELs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

NEC / ERM

FIGURE 10A: BY CONCENTRATION

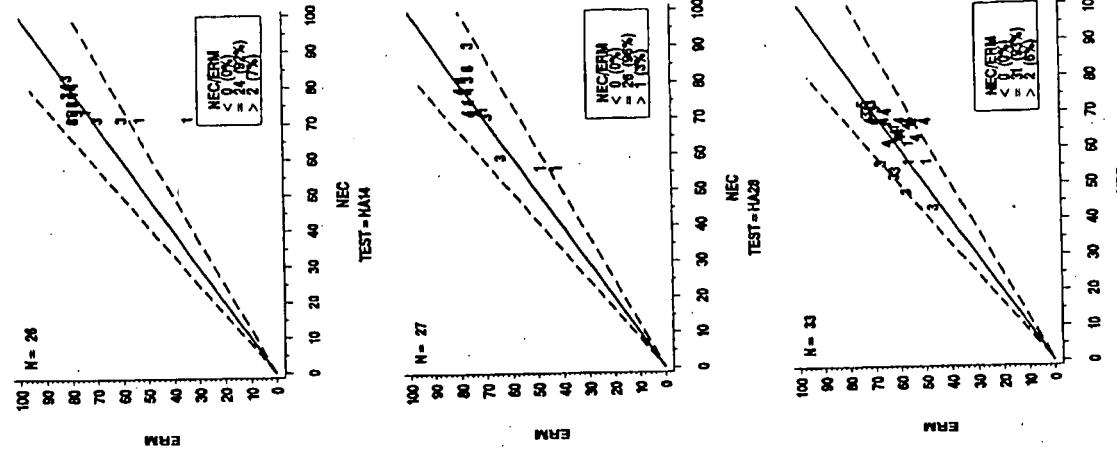
TEST = CR14



NEC / ERM

FIGURE 10B: % CORRECT

TEST = CR14



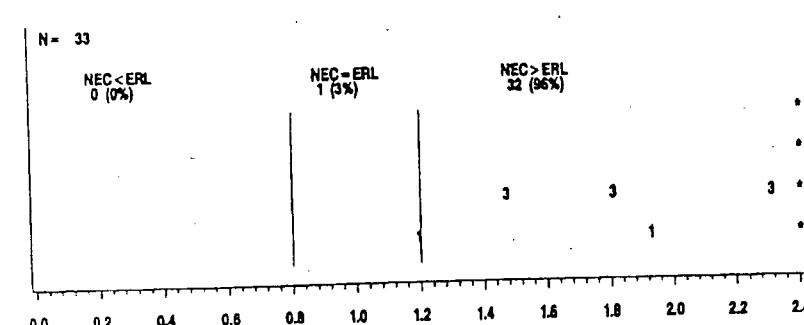
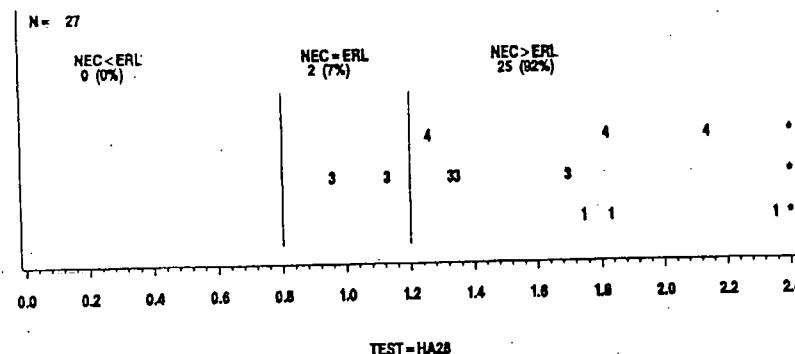
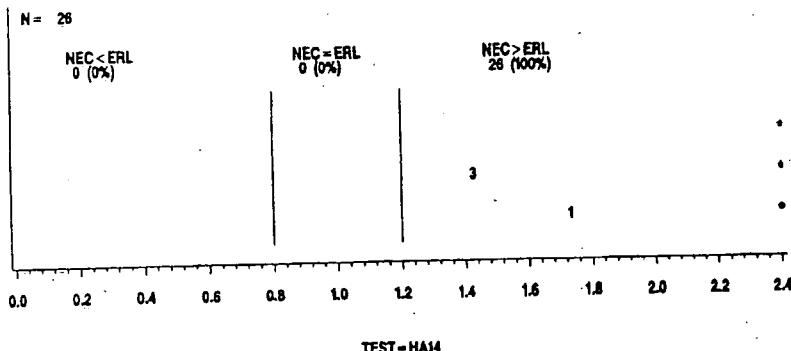
Figures 10a and 10b.

Comparability and reliability of NECs and ERMs calculated using dry-weight concentrations and the entire database. See the page preceding Figure 1 in the report for additional detail.

NEC / ERL

FIGURE 11A: BY CONCENTRATION

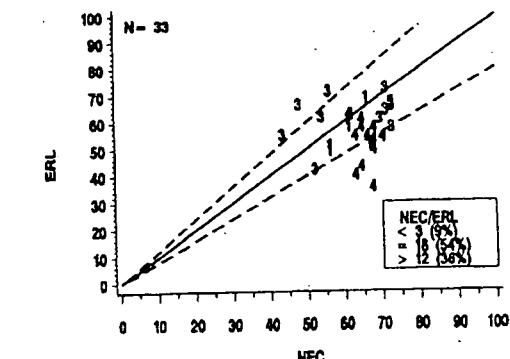
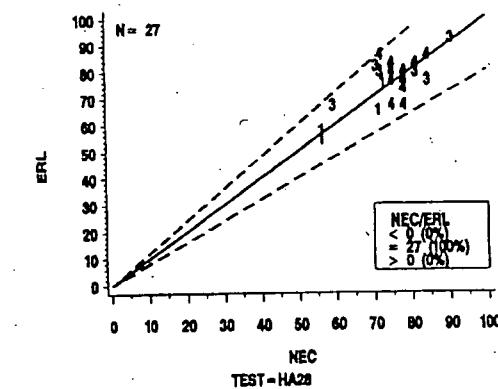
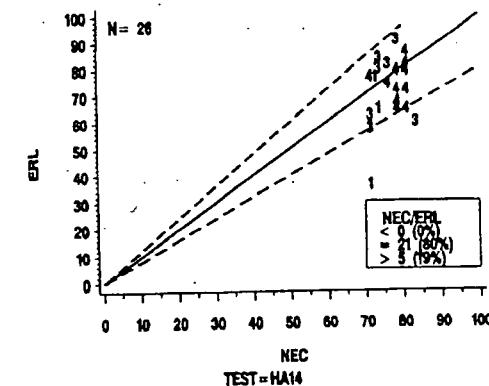
TEST = CR14



NEC / ERL

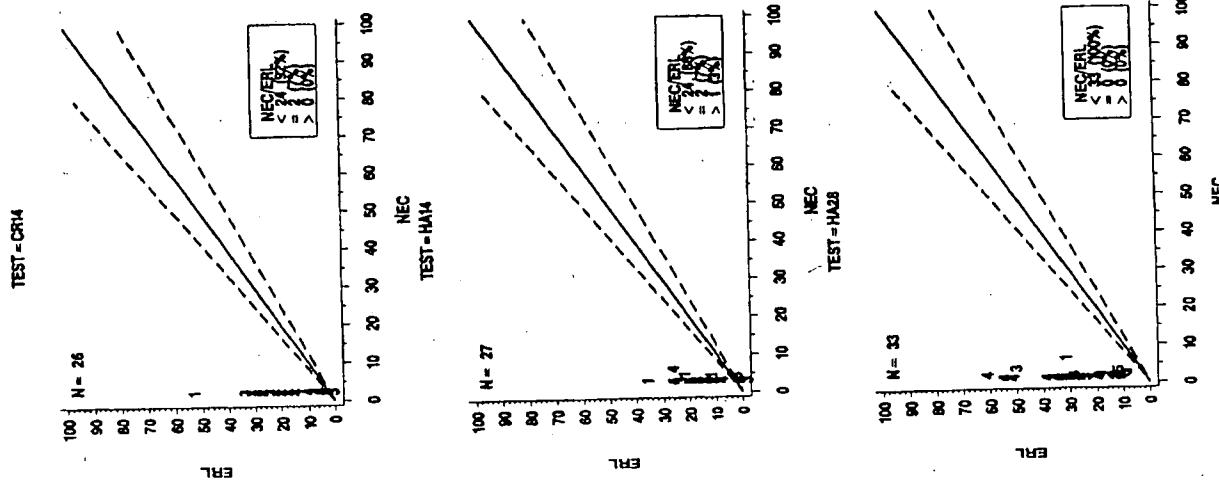
FIGURE 11B: % CORRECT

TEST = CR14



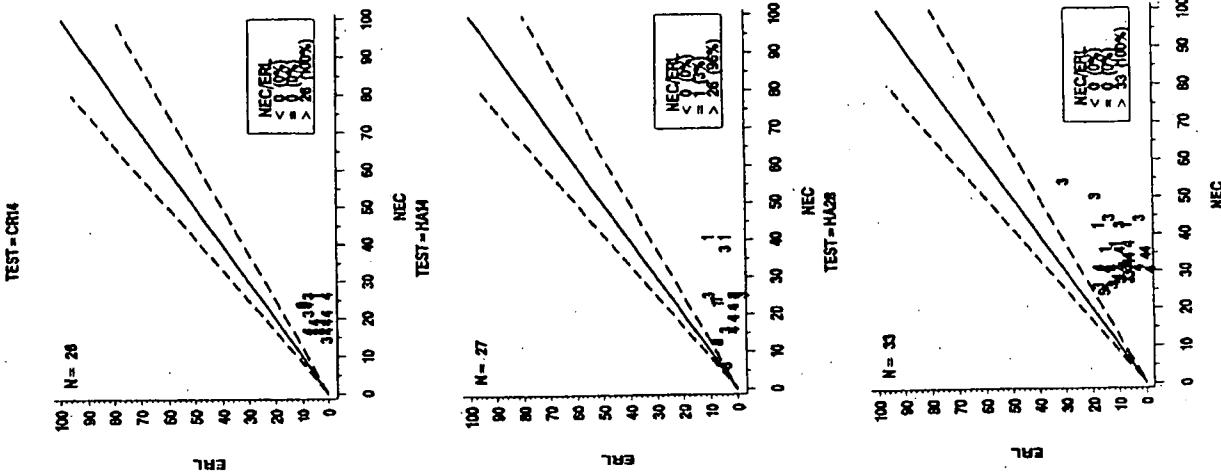
NEC / ERL

FIGURE 11C: % TYPE I



NEC / ERL

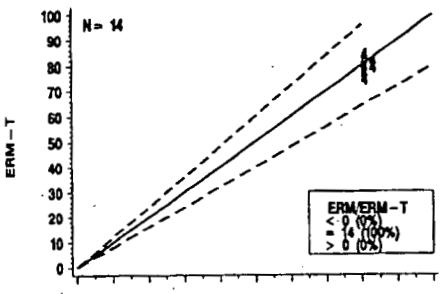
FIGURE 11D: % TYPE II



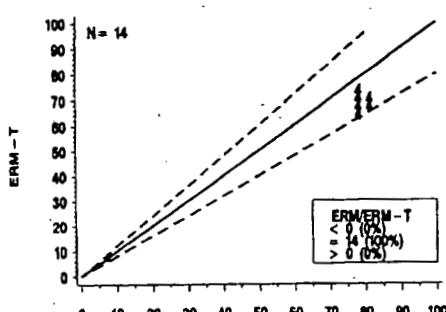
ERM / ERM-T

FIGURE 12A: % CORRECT

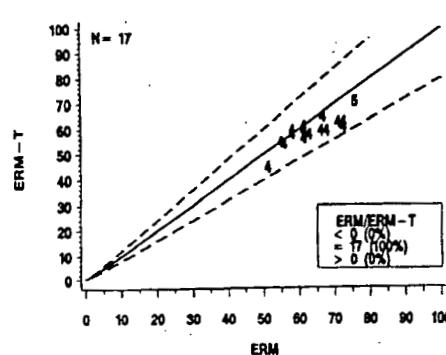
TEST = CR14



TEST = HA14



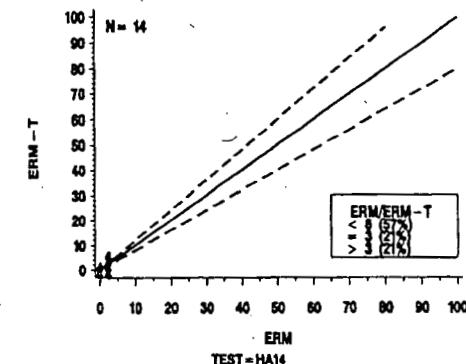
TEST = HA28



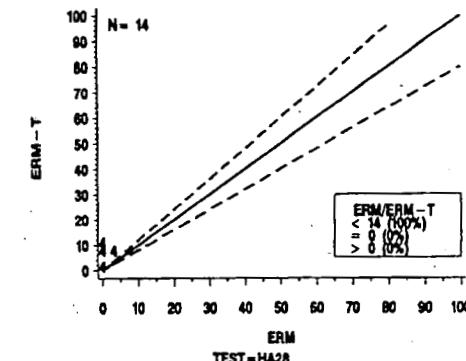
ERM / ERM-T

FIGURE 12B: % TYPE I

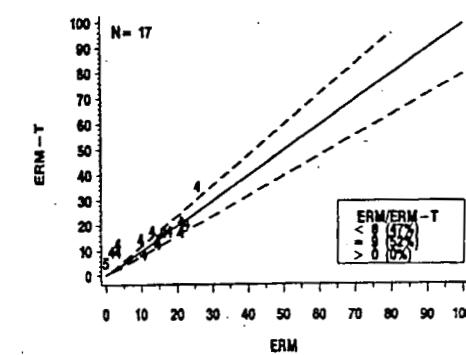
TEST = CR14



TEST = HA14



TEST = HA28



Figures 12a and 12b.

Reliability of ERMs calculated using dry-weight concentrations and using sediment concentrations normalized to total organic carbon (TOC; ERM-T) concentrations for the entire database. See the page preceding Figure 1 in the report for additional detail.

ERM / ERM-T

FIGURE 12C: % TYPE II

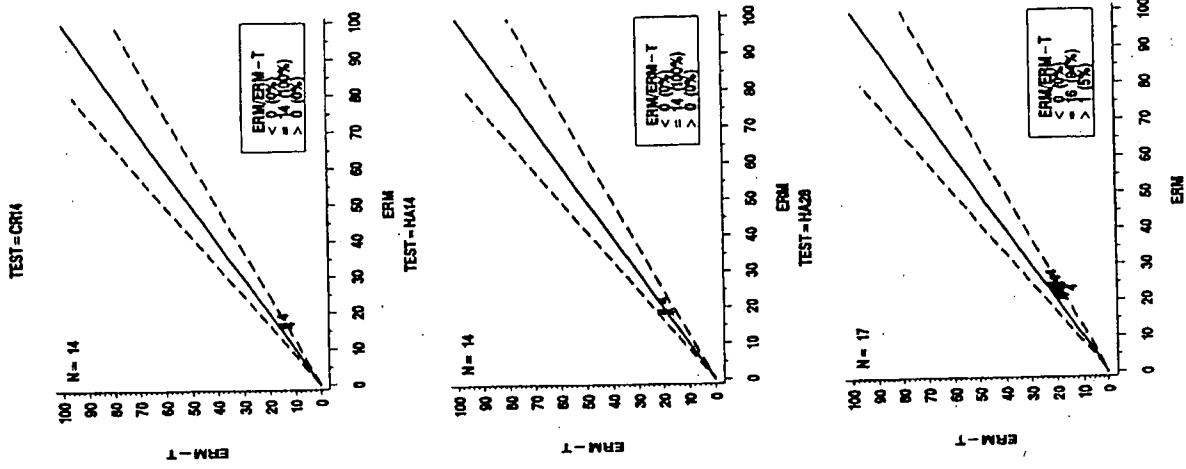
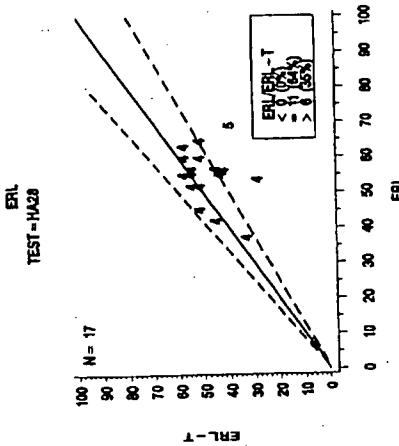
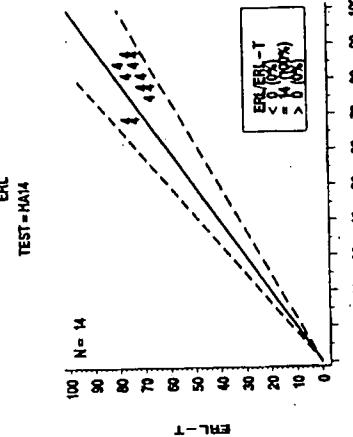
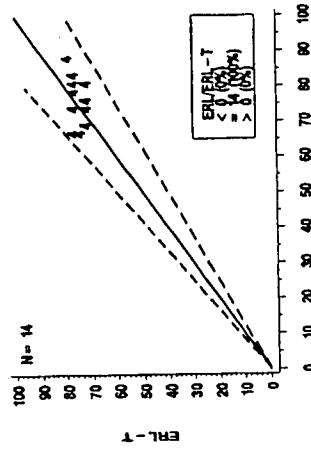


Figure 12c.

Reliability of ERMs calculated using dry-weight concentrations and using sediment concentrations normalized to total organic carbon (TOC; ERM-T) concentrations for the entire database. See the page preceding Figure 1 in the report for additional detail.

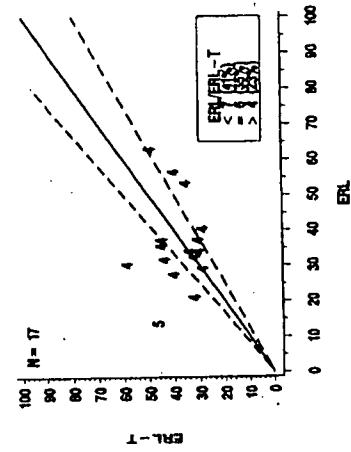
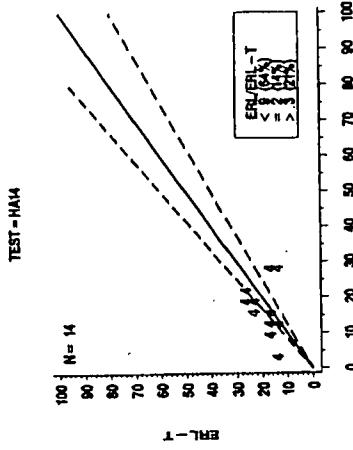
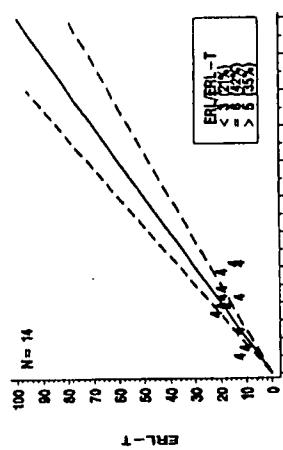
ERL / ERL-T
FIGURE 13A: % CORRECT

TEST = CRM



ERL / ERL-T
FIGURE 13B: % TYPE I

TEST = CRM



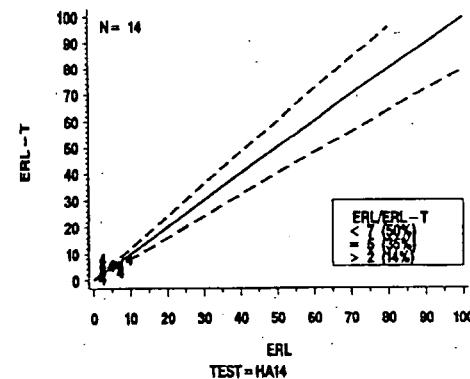
Figures 13a and 13b.

Reliability of ERLs calculated using dry-weight concentrations and using sediment concentrations normalized to TOC (ERL-T) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

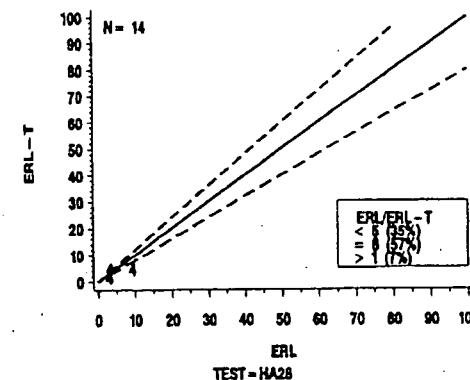
ERL / ERL-T

FIGURE 13C: % TYPE II

TEST=CR14



TEST=HA14



TEST=HA28

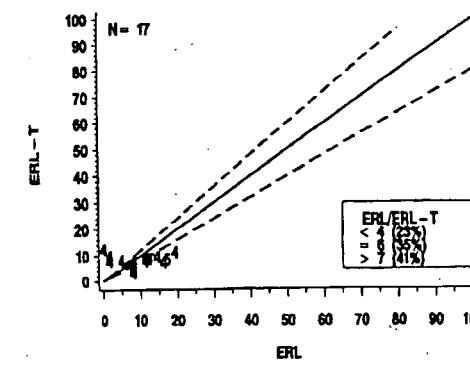


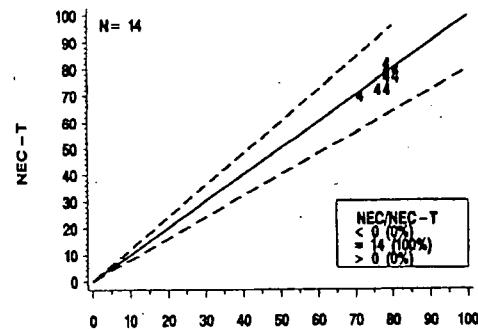
Figure 13c.

Reliability of ERLs calculated using dry-weight concentrations and using sediment concentrations normalized to TOC (ERL-T) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

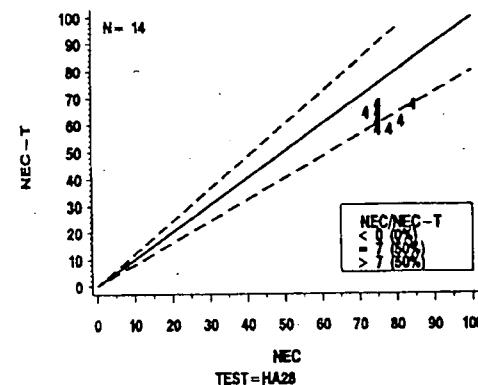
NEC / NEC-T

FIGURE 14A: % CORRECT

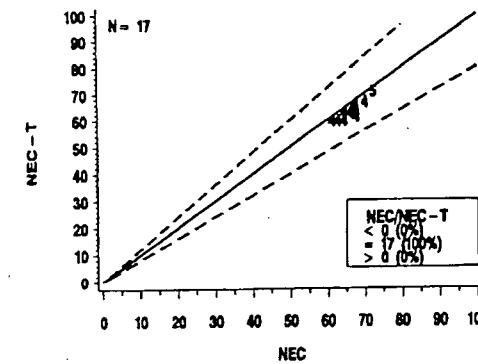
TEST=CR14



TEST=HA14



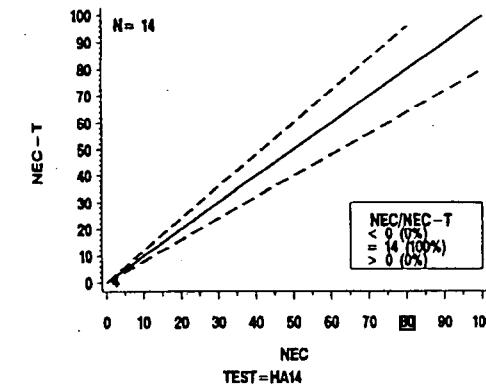
TEST=HA28



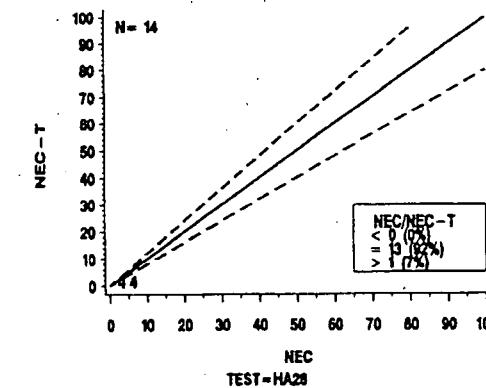
NEC / NEC-T

FIGURE 14B: % TYPE I

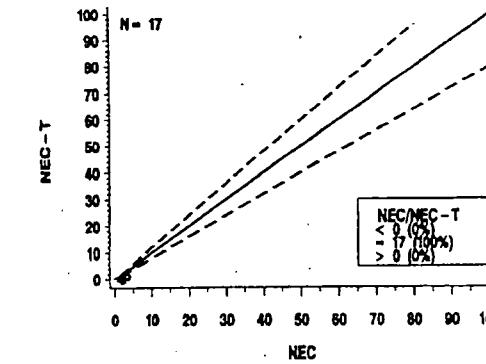
TEST=CR14



TEST=HA14



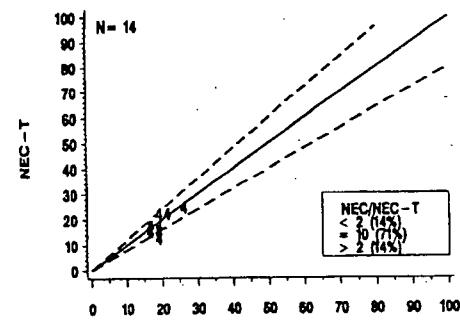
TEST=HA28



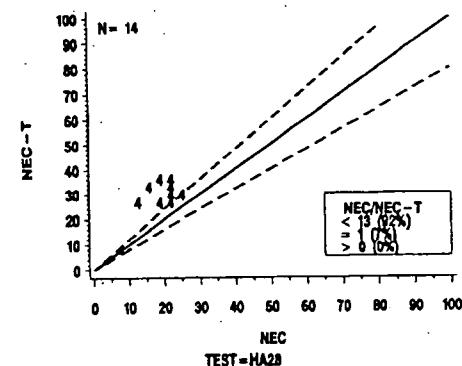
NEC / NEC-T

FIGURE 14C: % TYPE II

TEST=CR14



TEST=HA14



TEST=HA2B

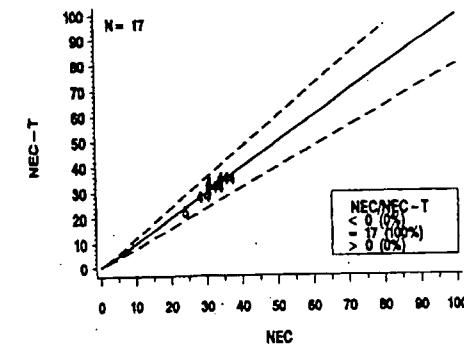


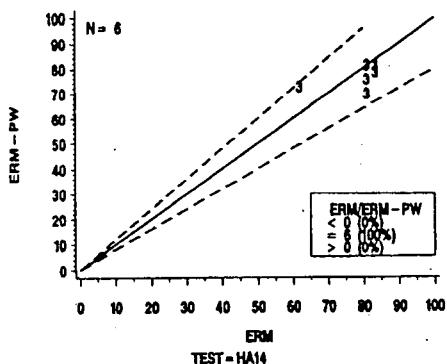
Figure 14c.

Reliability of NECs calculated using dry-weight concentrations and using sediment concentrations normalized to TOC (NEC-T) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

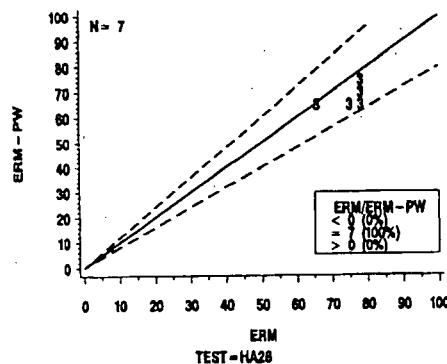
ERM / ERM - PW

FIGURE 15A: % CORRECT

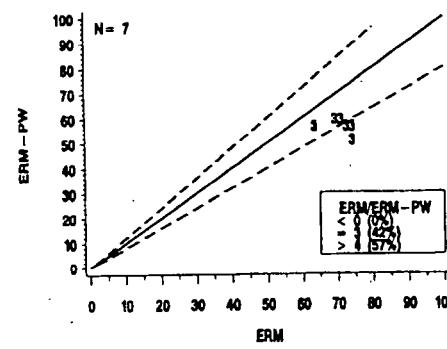
TEST = CR14



TEST = HA14



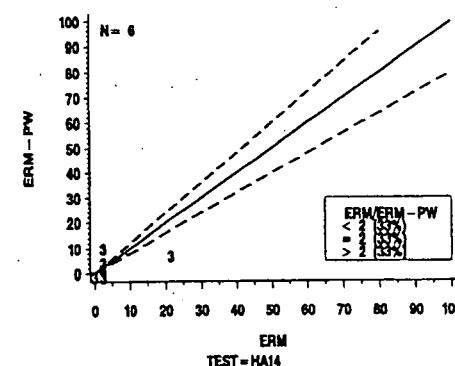
TEST = HA28



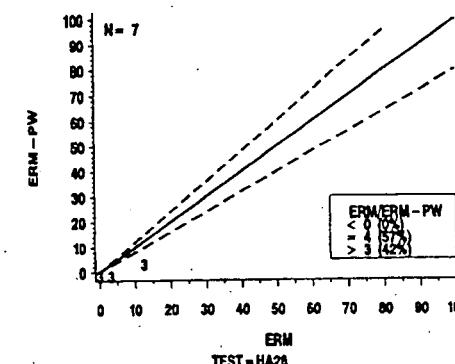
ERM / ERM - PW

FIGURE 15B: % TYPE I

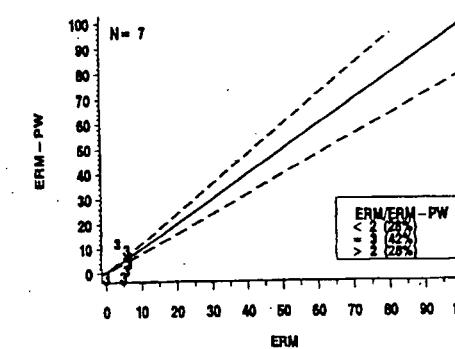
TEST = CR14



TEST = HA14



TEST = HA28



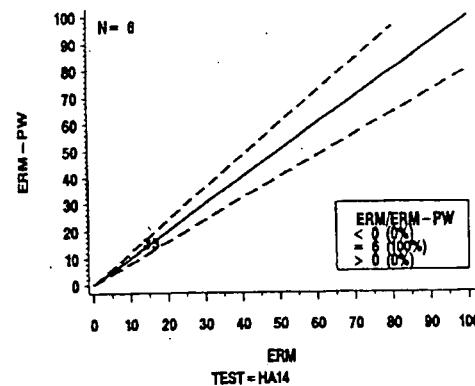
Figures 15a and 15b.

Reliability of ERMs for metals calculated using dry-weight concentrations and pore-water (ERM-PW) concentrations for the entire database. See the page preceding Figure 1 in the report for additional detail.

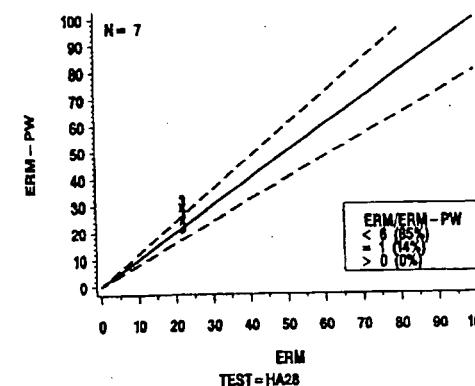
ERM / ERM-PW

FIGURE 15C: % TYPE II

TEST=CR14



TEST=HA14



TEST=HA28

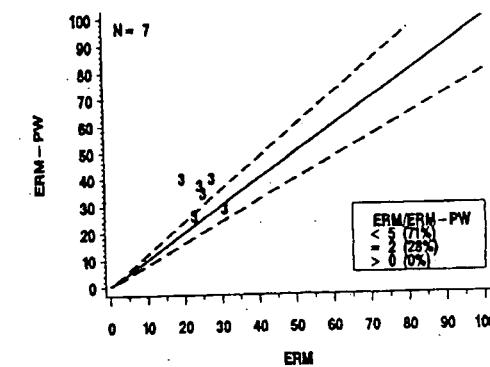


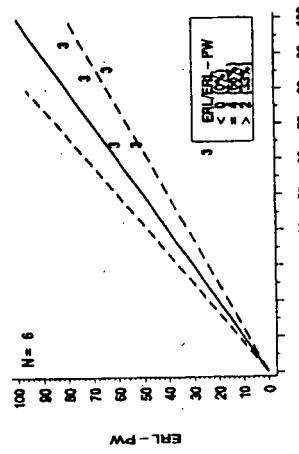
figure 15c.

Reliability of ERMs for metals calculated using dry-weight concentrations and pore-water (ERM-PW) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

ERL / ERL-PW

FIGURE 16A: % CORRECT

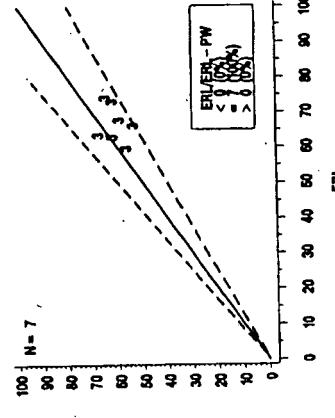
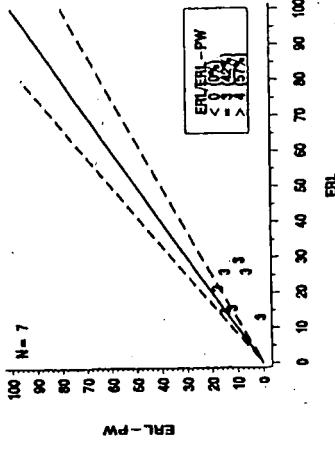
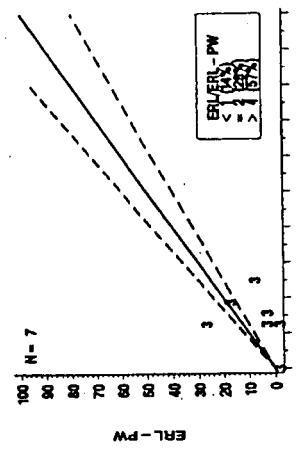
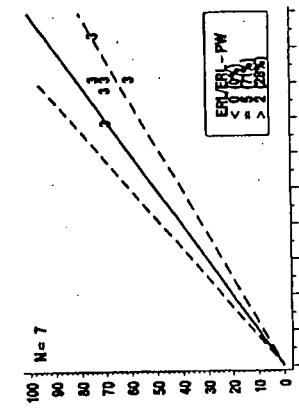
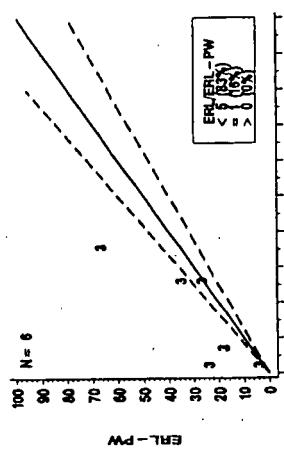
TEST = CRI4



ERL / ERL-PW

FIGURE 16B: % TYPE I

TEST = CRI4



Figures 16a and 16b.

Reliability of ERLs for metals calculated using dry-weight concentrations and pore-water (ERL-PW) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

ENL / ENL - PW
FIGURE 16C: % TYPE II

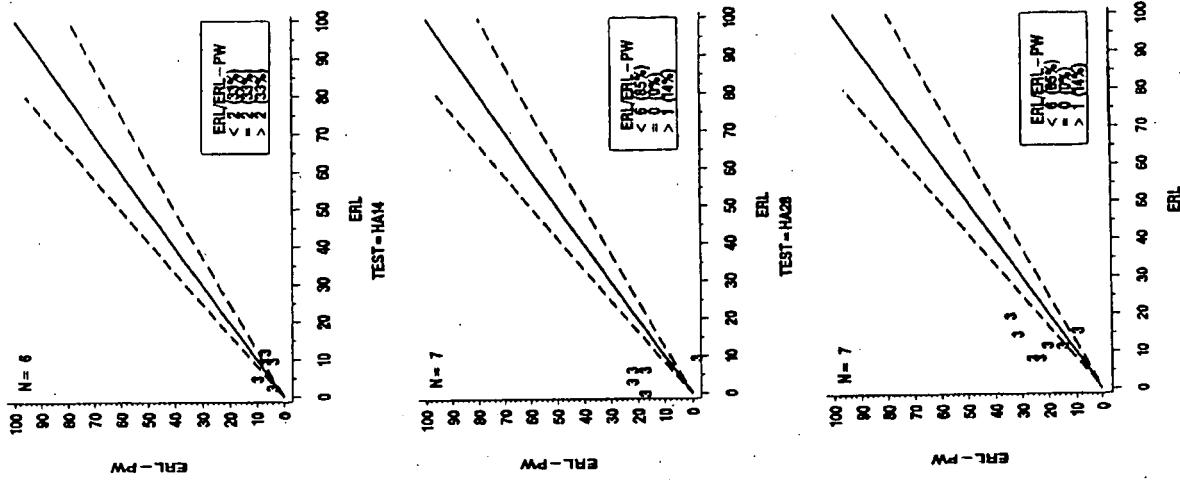
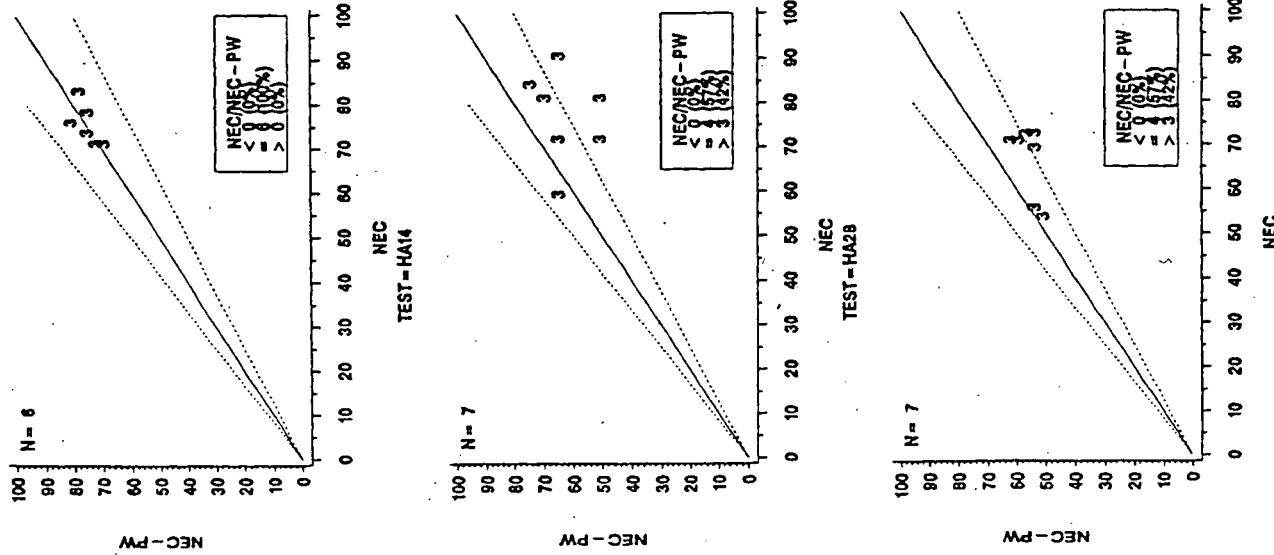


Figure 16c. Reliability of ENLs for metals calculated using dry-weight concentrations and pore-water (ERL-PW) concentrations for the entire database. See the page preceding Figure 1 in the report for additional detail.

NEC / NEC – PW

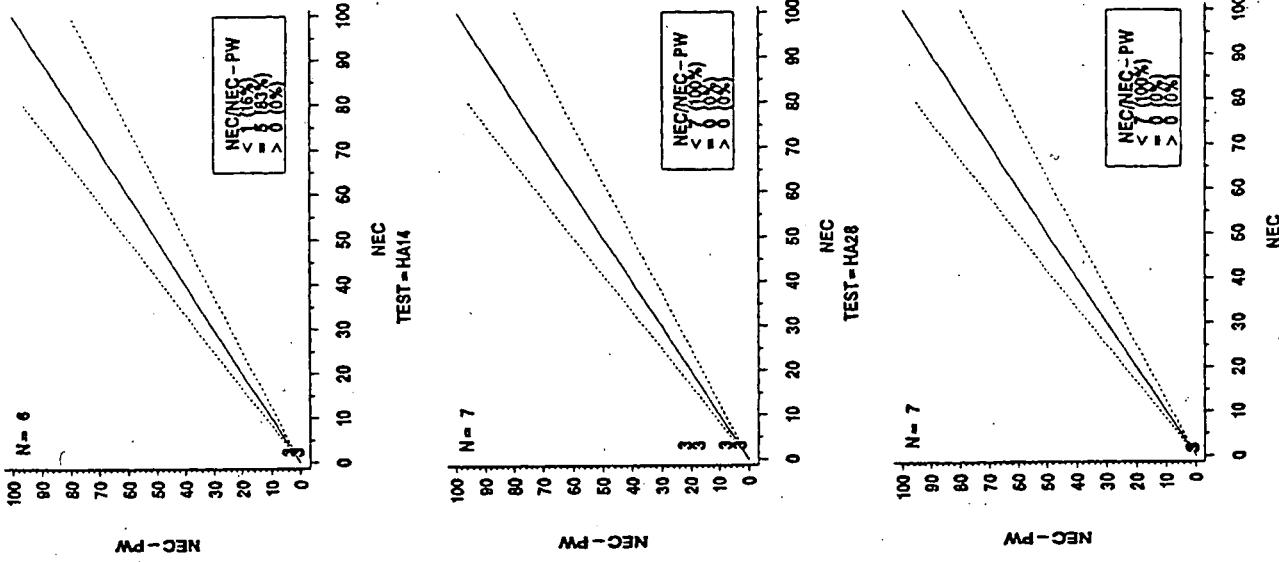
FIGURE 17A: % CORRECT

FIGURE 17B: % TYPE I



NEC / NEC.

FIGURE 17B: % TYPE I



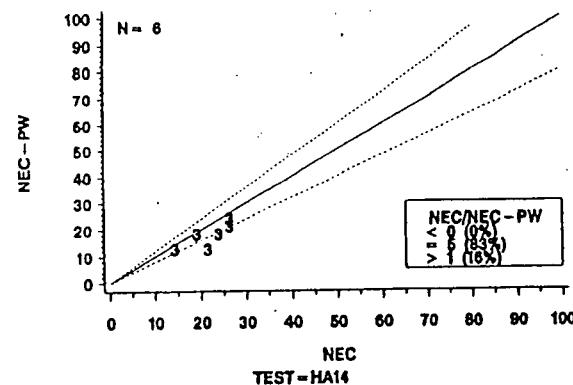
Figures 17a and 17b.

Figure 1 in thereport for additional detail.

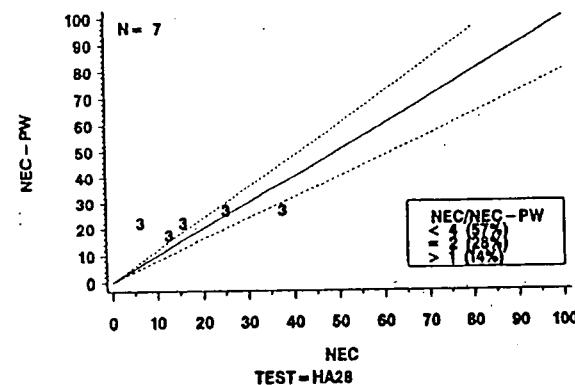
NEC / NEC-PW

FIGURE 17C: % TYPE II

TEST = CR14



TEST = HA14



TEST = HA28

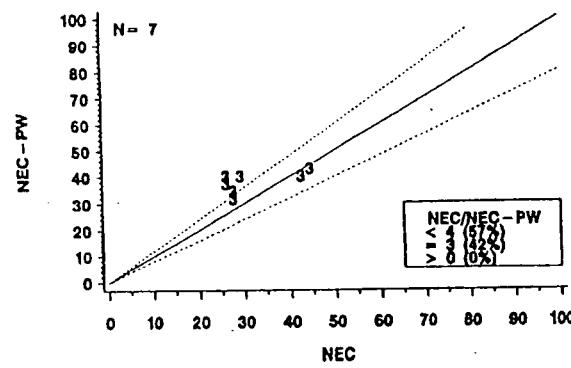
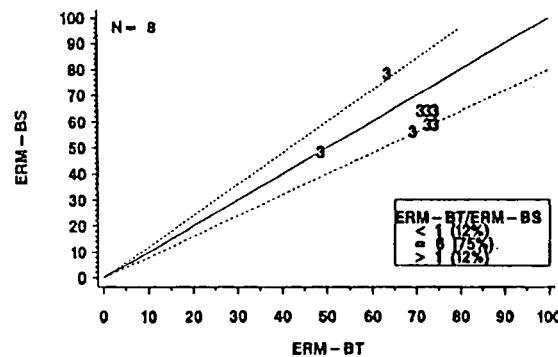
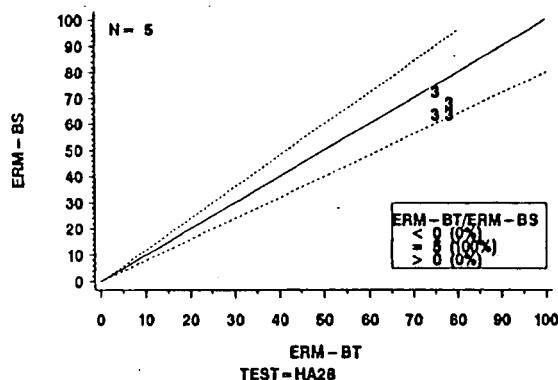
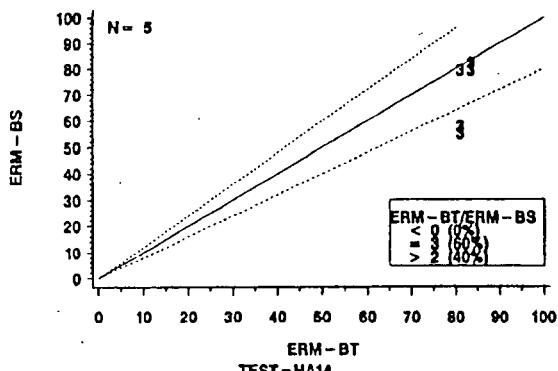


Figure 17c. Reliability of NECs for metals calculated using dry-weight concentrations and pore-water (NEC-PW) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

ERM-BT / ERM-BS

FIGURE 18A: % CORRECT

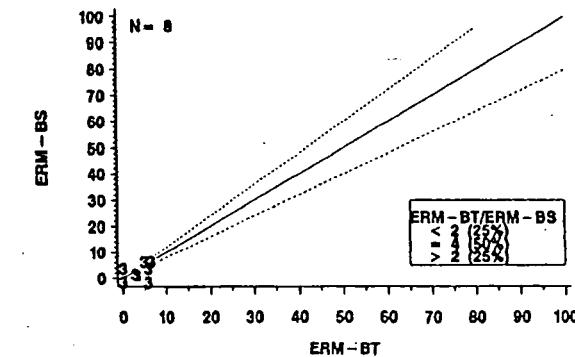
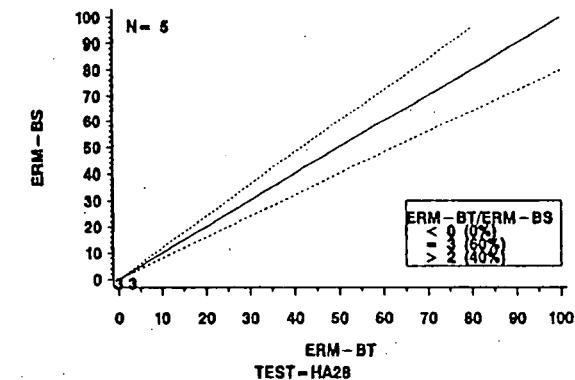
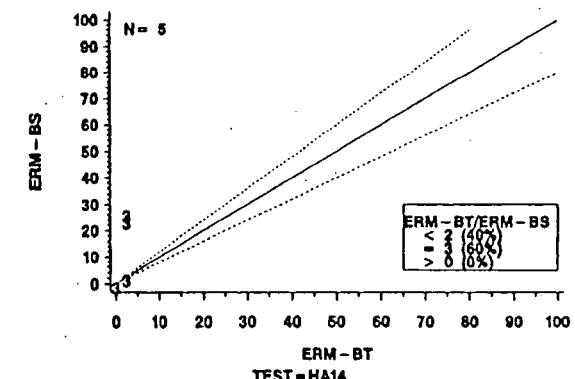
TEST-CR14



ERM-BT / ERM-BS

FIGURE 18B: % TYPE I

TEST-CR14



Figures 18a and 18b. Reliability of ERMs calculated using total-metal (ERM-BT) concentrations and simultaneously extracted metal (ERM-BS concentrations for the entire database
See the page preceding Figure 1 in the report for additional detail.

ERM-BT / ERM-BS

FIGURE 18C: % TYPE II

TEST=CR14

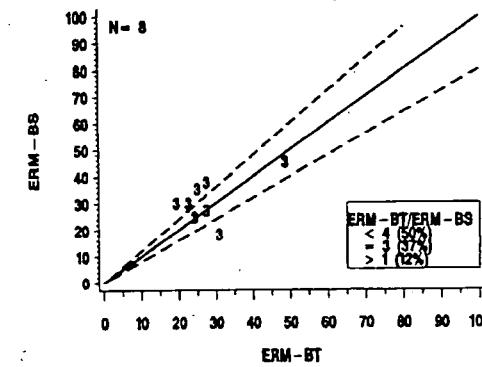
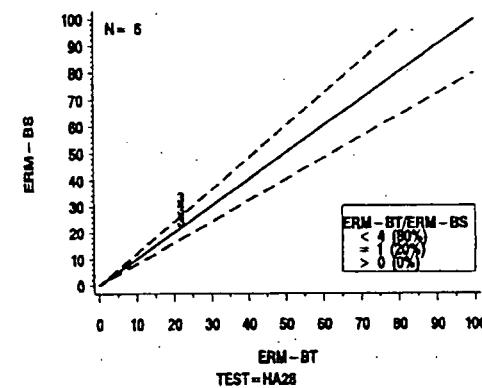
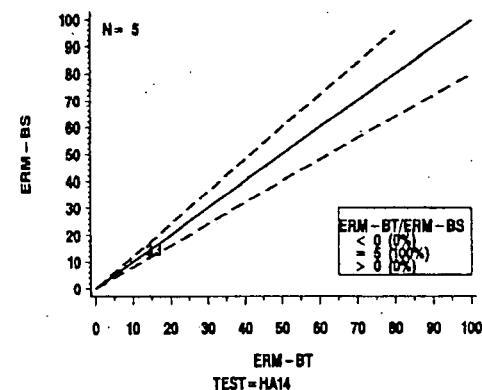


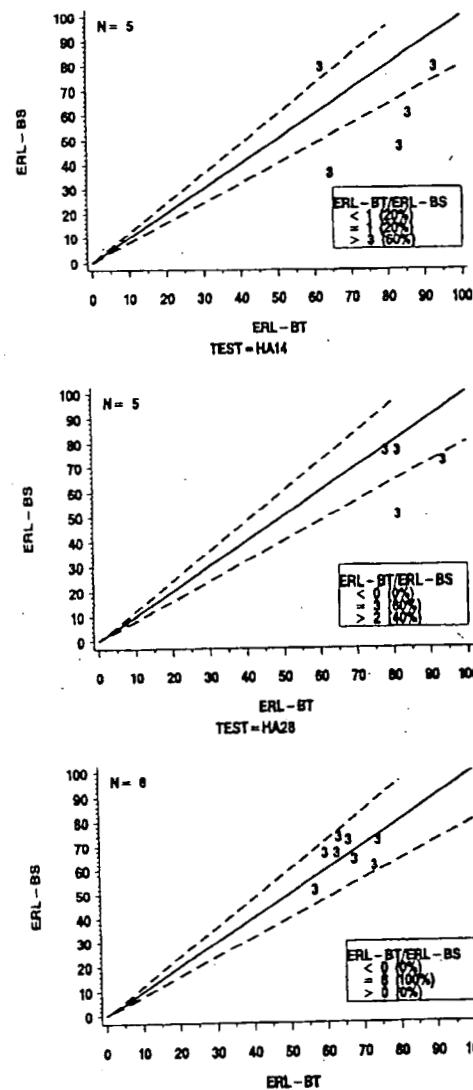
figure 18c.

Reliability of ERMs calculated using total-metal (ERM-BT) concentrations and simultaneously extracted metal (ERM-BS) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

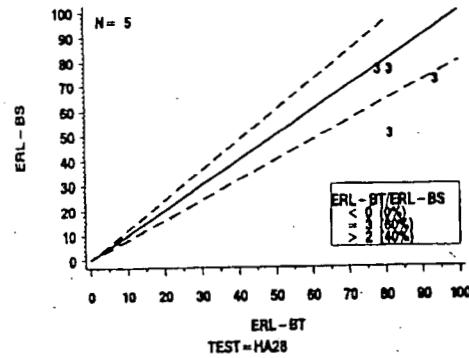
ERL-BT / ERL-BS

FIGURE 19A: % CORRECT

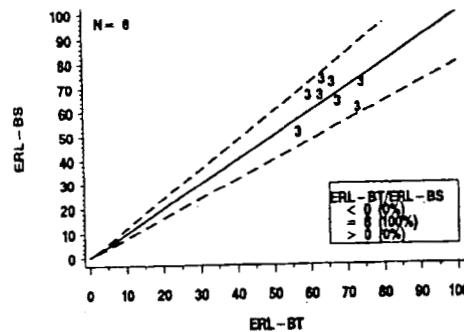
TEST=CR14



TEST=HA14



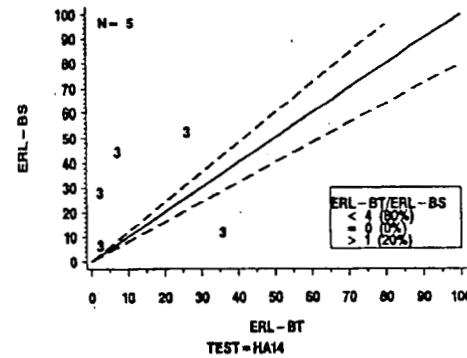
TEST=HA28



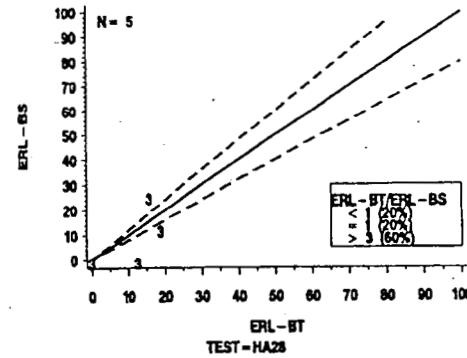
ERL-BT / ERL-BS

FIGURE 19B: % TYPE I

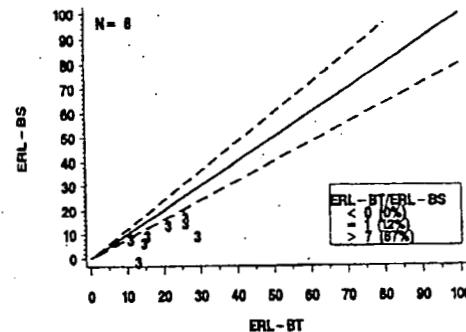
TEST=CR14



TEST=HA14



TEST=HA28



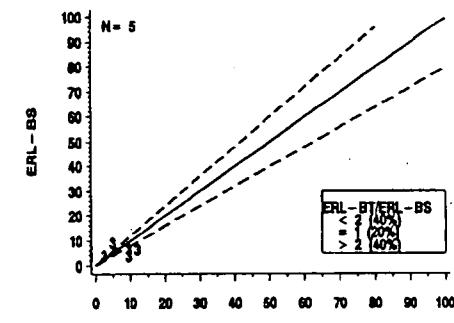
Figures 19a and 19b.

Reliability of ERLs calculated using total-metal concentrations (ERL-BT) and simultaneously extracted metal (ERL-BS) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

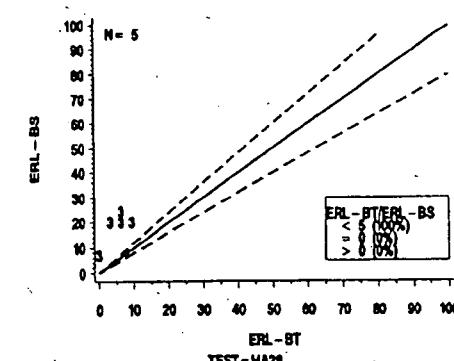
ERL-BT / ERL-BS

FIGURE 19C: % TYPE II

TEST-CR14



TEST-HA14



TEST-HA28

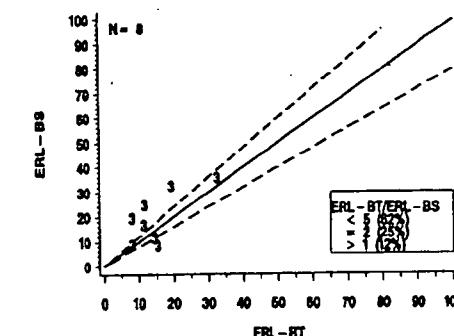


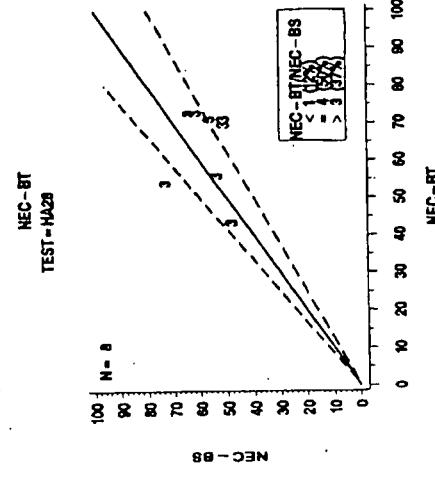
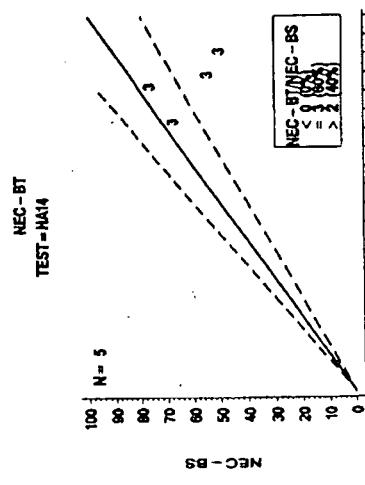
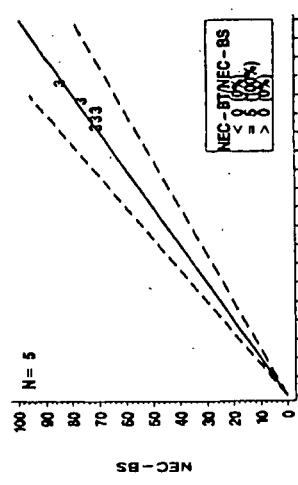
Figure 19c.

Reliability of ERLs calculated using total-metal concentrations (ERL-BT) and simultaneously extracted metal (ERL-BS) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

NEC-BT / NEC-BS

FIGURE 20A: % CORRECT

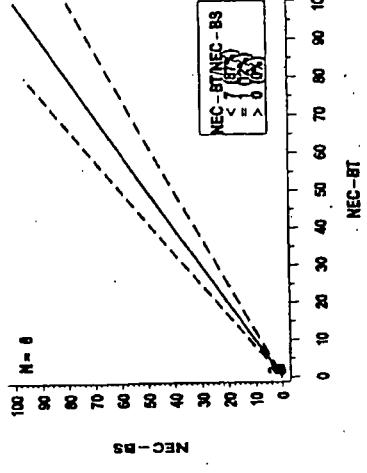
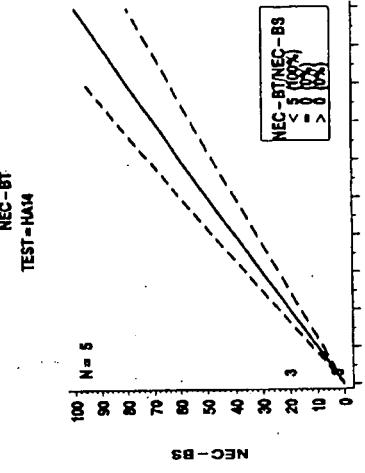
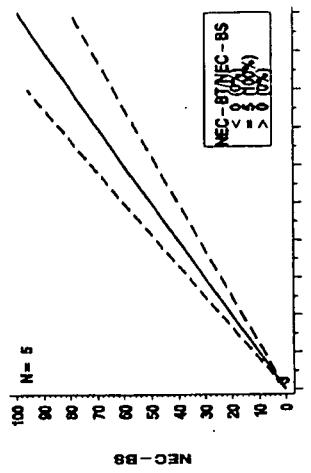
TEST-CR4



NEC-BT / NEC-BS

FIGURE 20B: % TYPE I

TEST-CR4



NEC-BT / NEC-BS

FIGURE 20C: X TYPE II

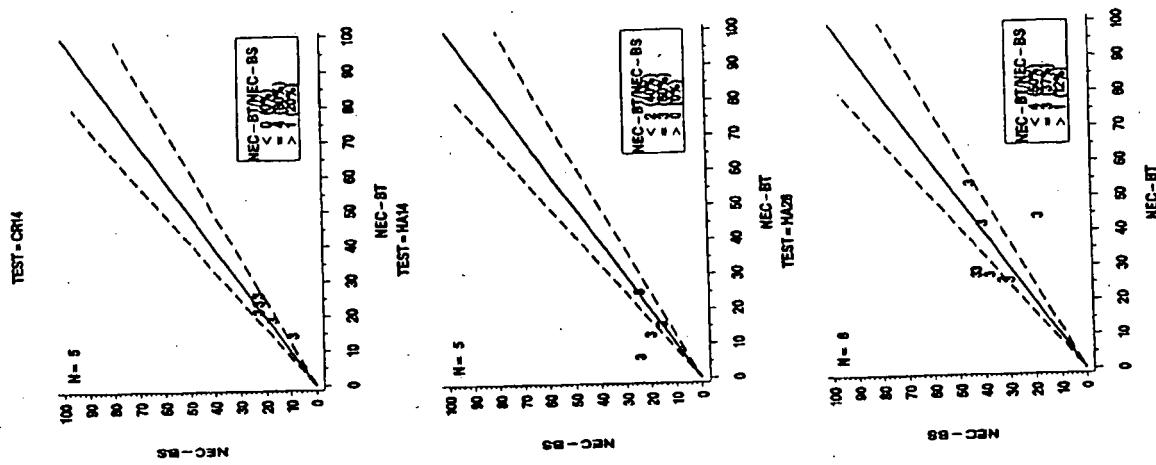


Figure 20c.

Reliability of NECs calculated using total-metal (NEC-BT) concentrations and simultaneously extracted metal (NEC-BS) concentrations for the entire database. See the page proceeding Figure 1 in the report for additional detail.

- ERM -

FIGURE 2A: ALL ERMs

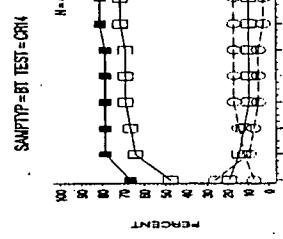


FIGURE 2B: 80% CRITERION

SAMP/TP = BT TEST = CR4

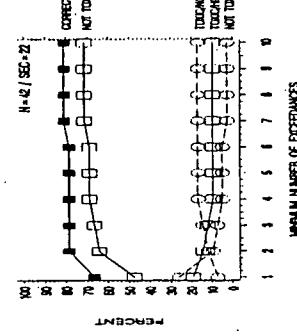
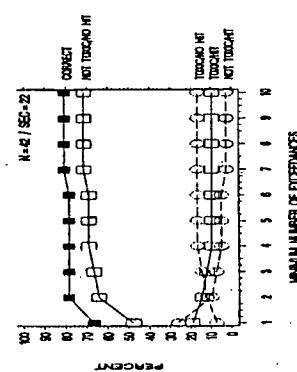


FIGURE 2C: 70% CRITERION

SAMP/TP = BT TEST = CR4



- ERM -

FIGURE 2D: 80% CRITERION

SAMP/TP = BT TEST = HAA

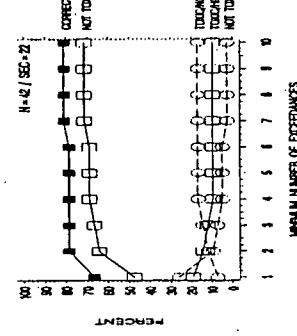
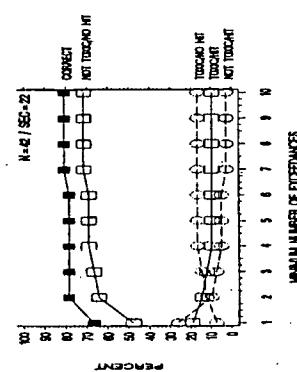


FIGURE 2E: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2F: 80% CRITERION

SAMP/TP = BT TEST = HAA

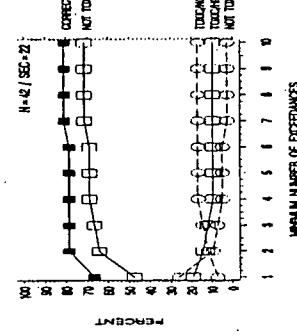
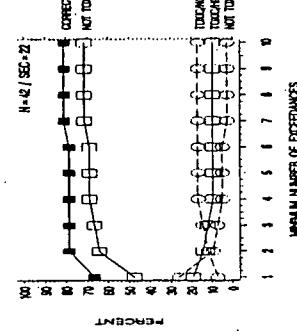


FIGURE 2G: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2H: 80% CRITERION

SAMP/TP = BT TEST = HAA

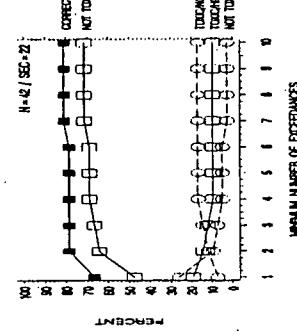
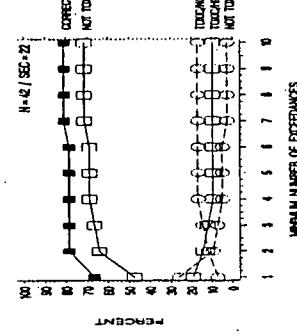


FIGURE 2I: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2J: 80% CRITERION

SAMP/TP = BT TEST = HAA

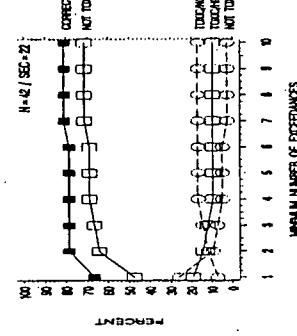
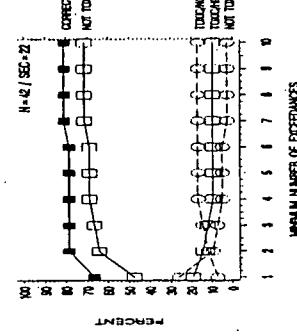


FIGURE 2K: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2L: 80% CRITERION

SAMP/TP = BT TEST = HAA

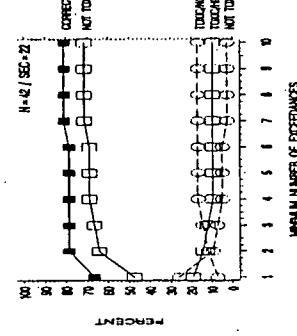
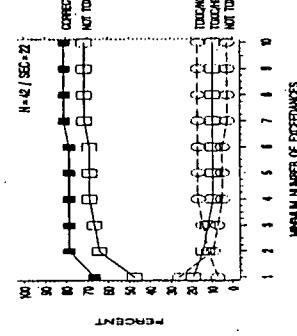


FIGURE 2M: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2N: 80% CRITERION

SAMP/TP = BT TEST = HAA

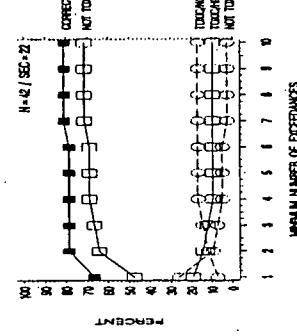
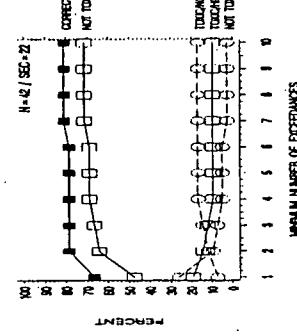


FIGURE 2O: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2P: 80% CRITERION

SAMP/TP = BT TEST = HAA

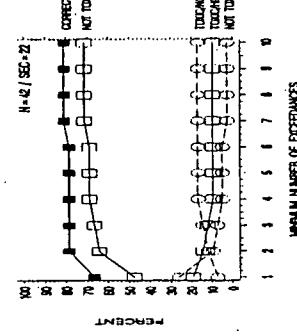
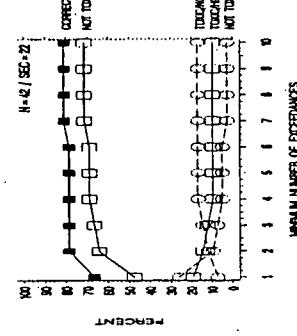


FIGURE 2Q: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2R: 80% CRITERION

SAMP/TP = BT TEST = HAA

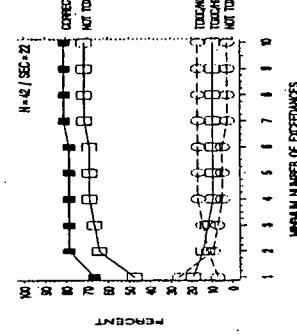
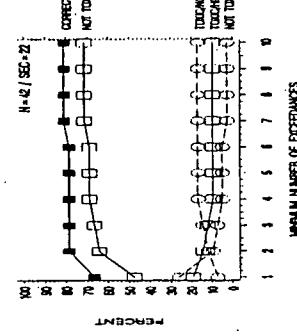


FIGURE 2S: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2T: 80% CRITERION

SAMP/TP = BT TEST = HAA

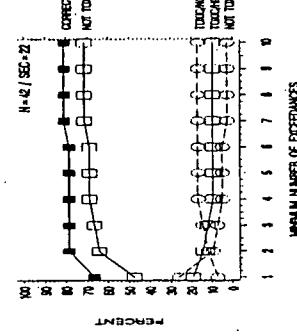
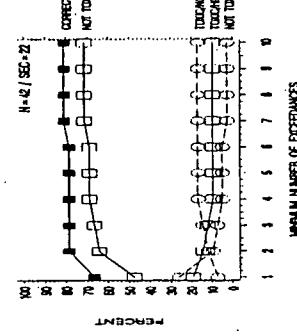


FIGURE 2U: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2V: 80% CRITERION

SAMP/TP = BT TEST = HAA

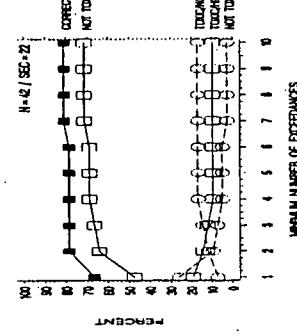
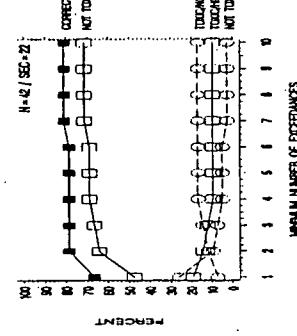


FIGURE 2W: 70% CRITERION

SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2X: 80% CRITERION

SAMP/TP = BT TEST = HAA

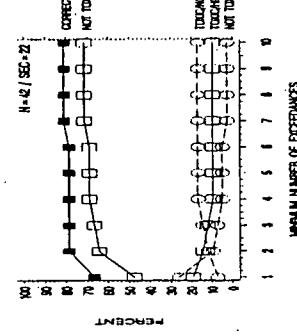
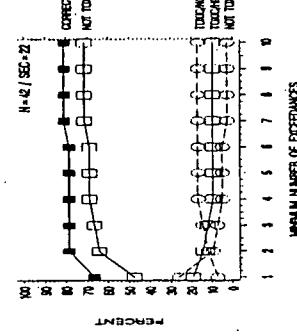


FIGURE 2Y: 70% CRITERION

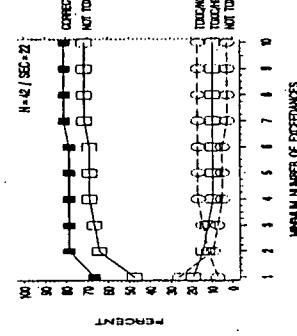
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2Z: 80% CRITERION

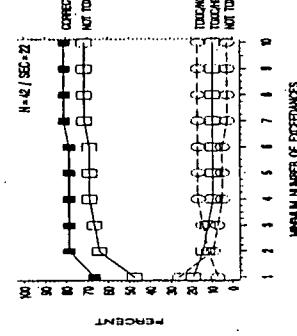
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AA: 70% CRITERION

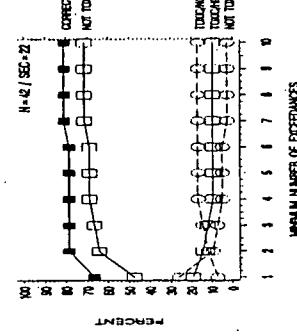
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AB: 80% CRITERION

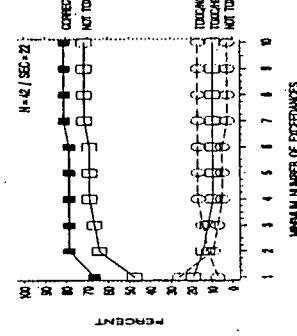
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AC: 70% CRITERION

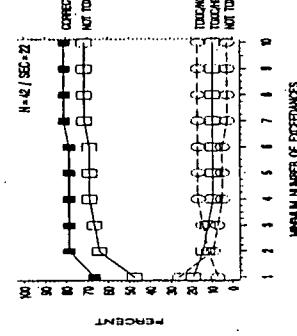
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AD: 80% CRITERION

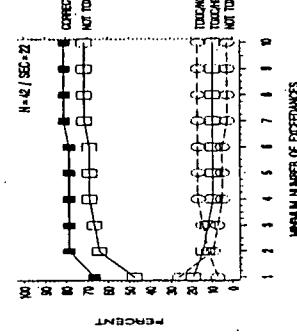
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AE: 70% CRITERION

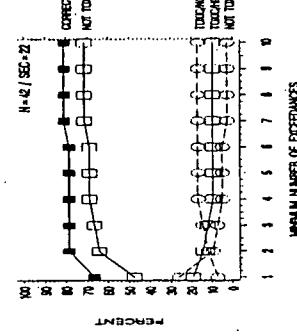
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AF: 80% CRITERION

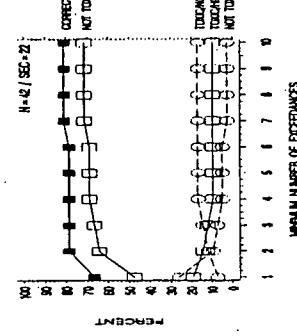
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AG: 70% CRITERION

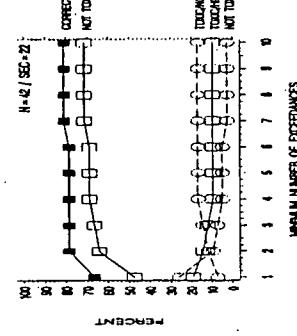
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AH: 80% CRITERION

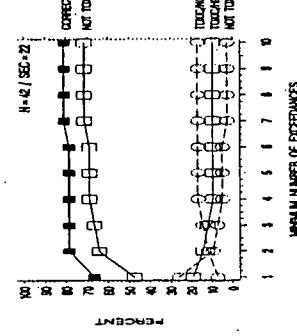
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AI: 70% CRITERION

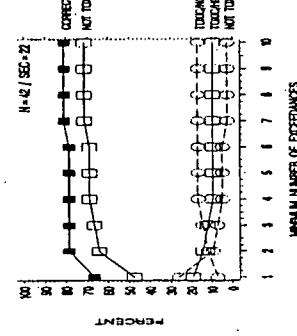
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AJ: 80% CRITERION

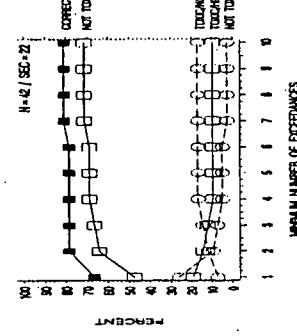
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AK: 70% CRITERION

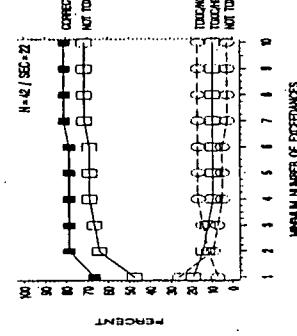
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AL: 80% CRITERION

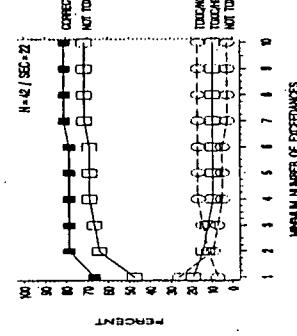
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AM: 70% CRITERION

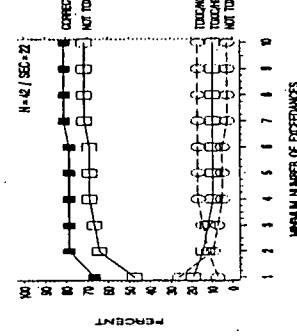
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AN: 80% CRITERION

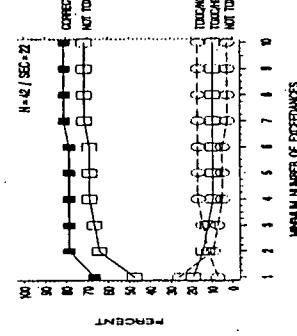
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AO: 70% CRITERION

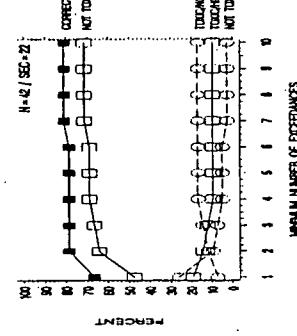
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AP: 80% CRITERION

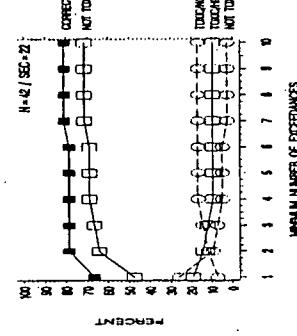
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AQ: 70% CRITERION

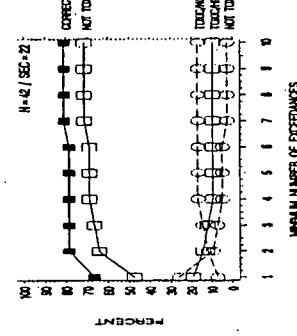
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AR: 80% CRITERION

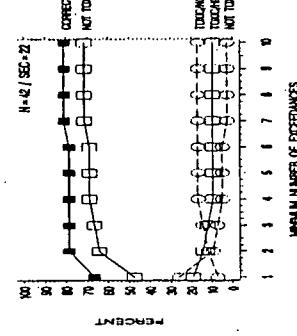
SAMP/TP = BT TEST = HAA



- ERM -

FIGURE 2AS: 70% CRITERION

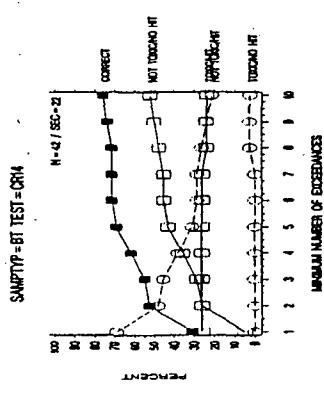
SAMP/TP = BT TEST = HAA



- ERM -

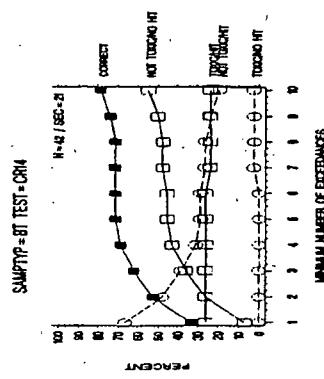
-ERL-

FIGURE 22: ERL CRITERION



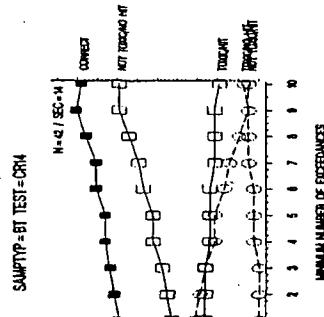
-ERL-

FIGURE 22: ERL CRITERION

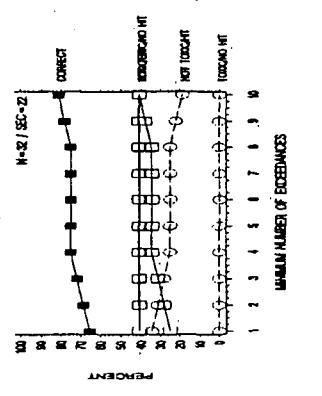


-ERL-

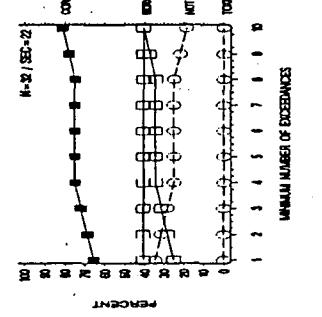
FIGURE 22: ERL CRITERION



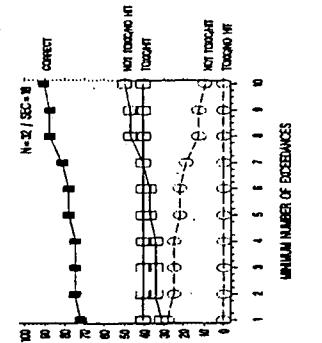
SAMP/TYP = BT TEST = HAA



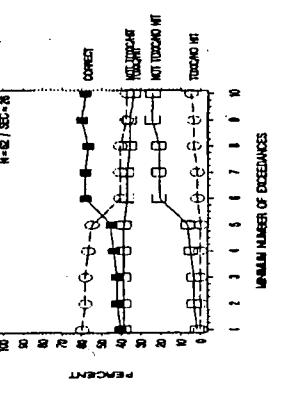
SAMP/TYP = BT TEST = HAA



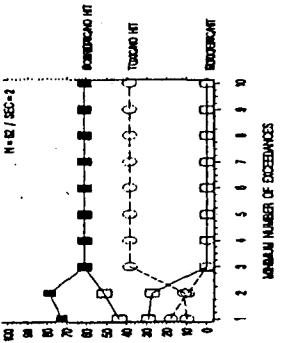
SAMP/TYP = BT TEST = HAA



SAMP/TYP = BT TEST = HACB



SAMP/TYP = BT TEST = HACB



SAMP/TYP = BT TEST = HACB

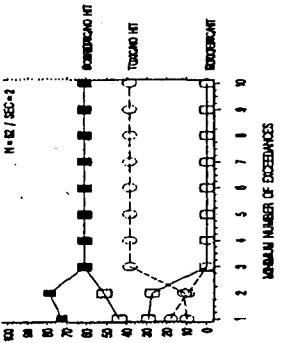


Figure 22

Observed and expected toxicity of samples based on the minimum number of ERL exceedances using dry-weight concentrations for the entire database. See legend of Figure 21 for a description of Figure 22.

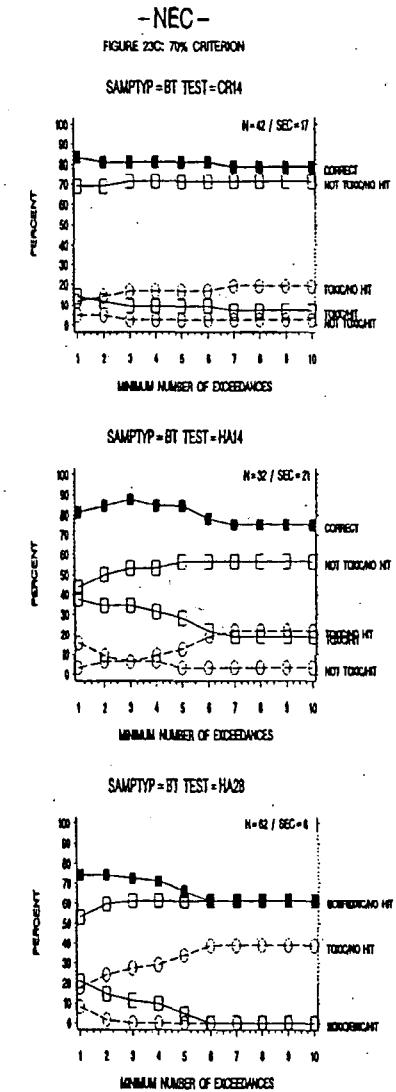
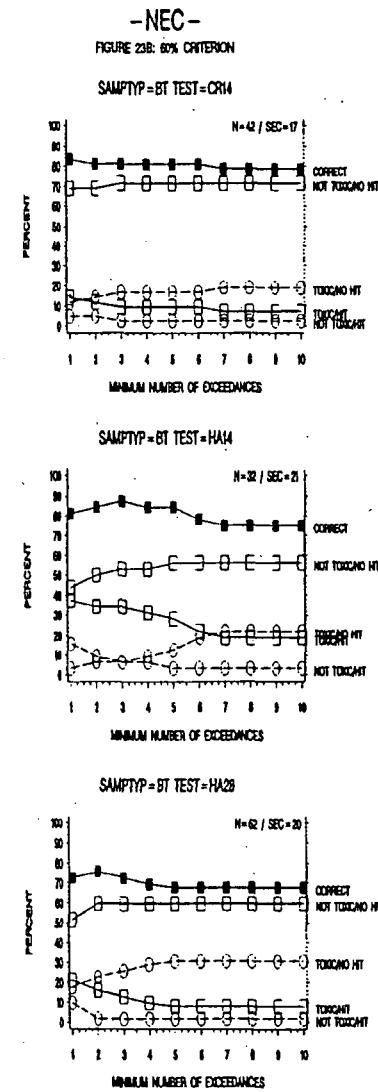
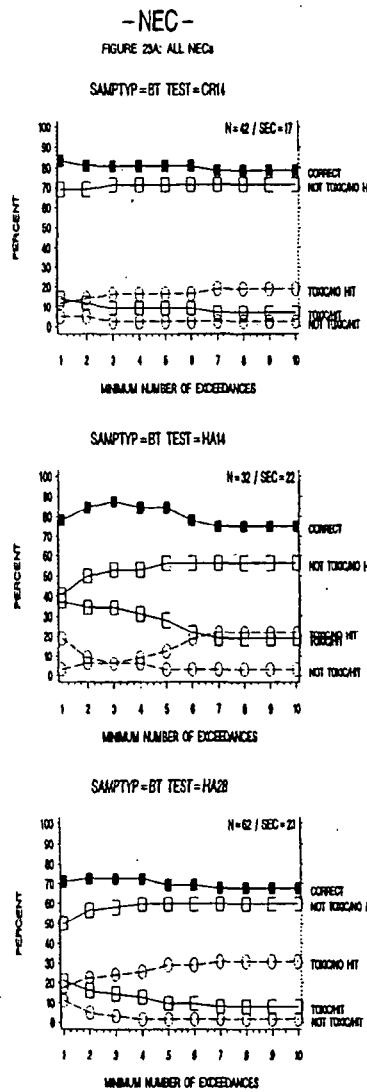


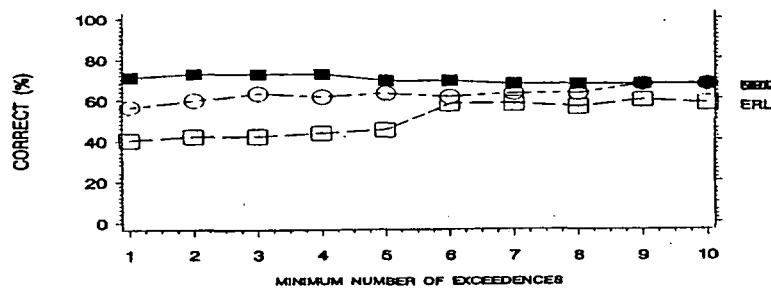
Figure 23

Observed and expected toxicity of samples based on the minimum number of NEC exceedances using dry-weight concentrations and using all individual NECs regardless of the percent correct classification for the entire database. See legend of Figure 21 for a description of Figure 23.

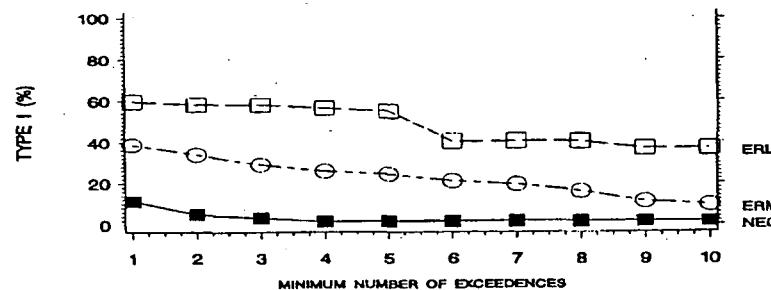
— NEC/ERM/ERL —

FIGURE 24

SAMPTYP = BT TEST = HA28



SAMPTYP = BT TEST = HA28



SAMPTYP = BT TEST = HA28

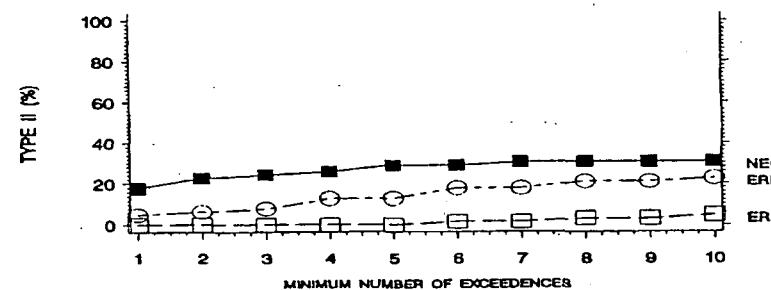
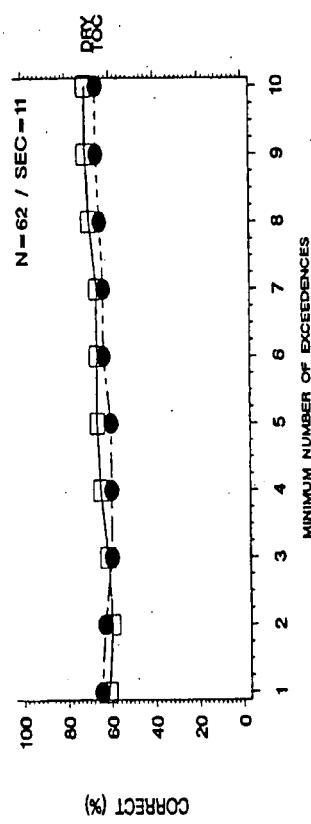


Figure 24 Observed and expected toxicity of HA28 samples based on the minimum number of NEC, ERM, and ERL exceedances for the entire database using dry-weight concentrations regardless of percentage correct classification by these individual ERMs. See legend of Figure 21 for a description of Figure 24.

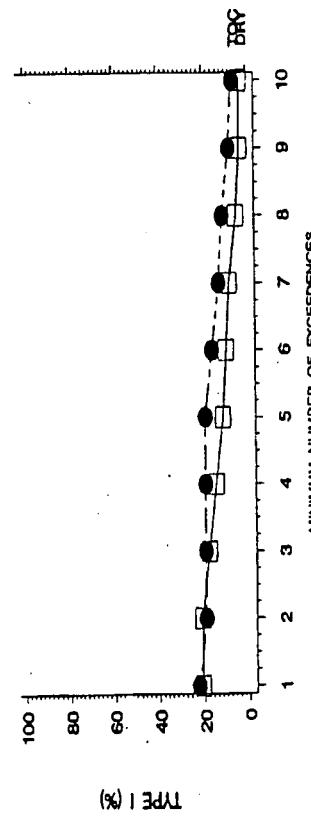
ERM

FIGURE 25: DRY - WEIGHT vs TOC NORMALIZATION

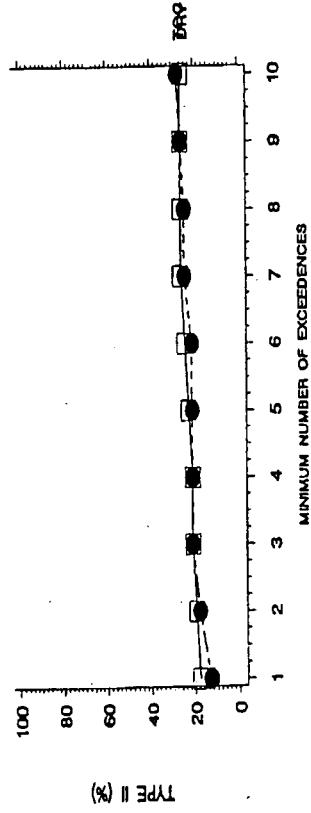
SAMPTYP = BT TEST = HA28



SAMPTYP = BT TEST = HA28



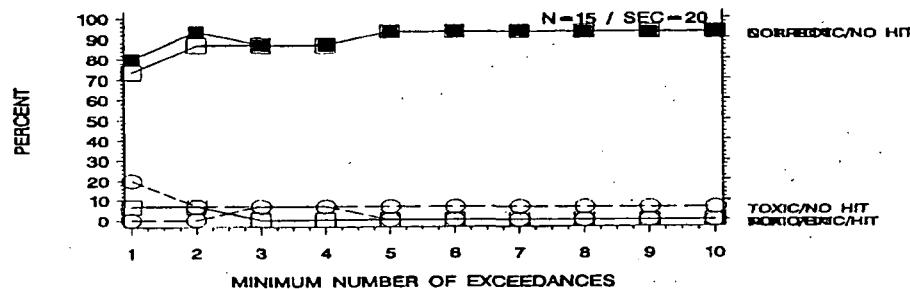
SAMPTYP = BT TEST = HA28



GL SECs - ERM - MT DATA

FIGURE 26: 70% CRITERION

SAMPTYP = BT TEST = CR14



SAMPTYP = BT TEST = HA28

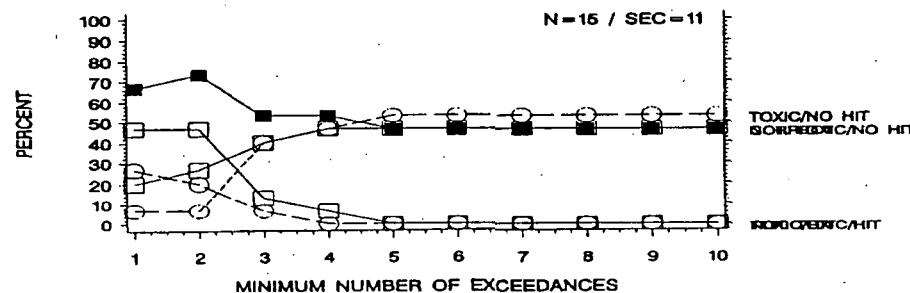


Figure 26

Observed and predicted toxicity of Clark Fork River samples based on the minimum number of Great Lakes ERM exceedances using dry-weight concentrations and using only those chemicals for which individual SECs correctly classify $\geq 70\%$ of the Great Lakes samples. See legend of Figure 21 for a description of Figure 26.

THRESHOLDS
FIGURE 27
CHEM CODE = BAP

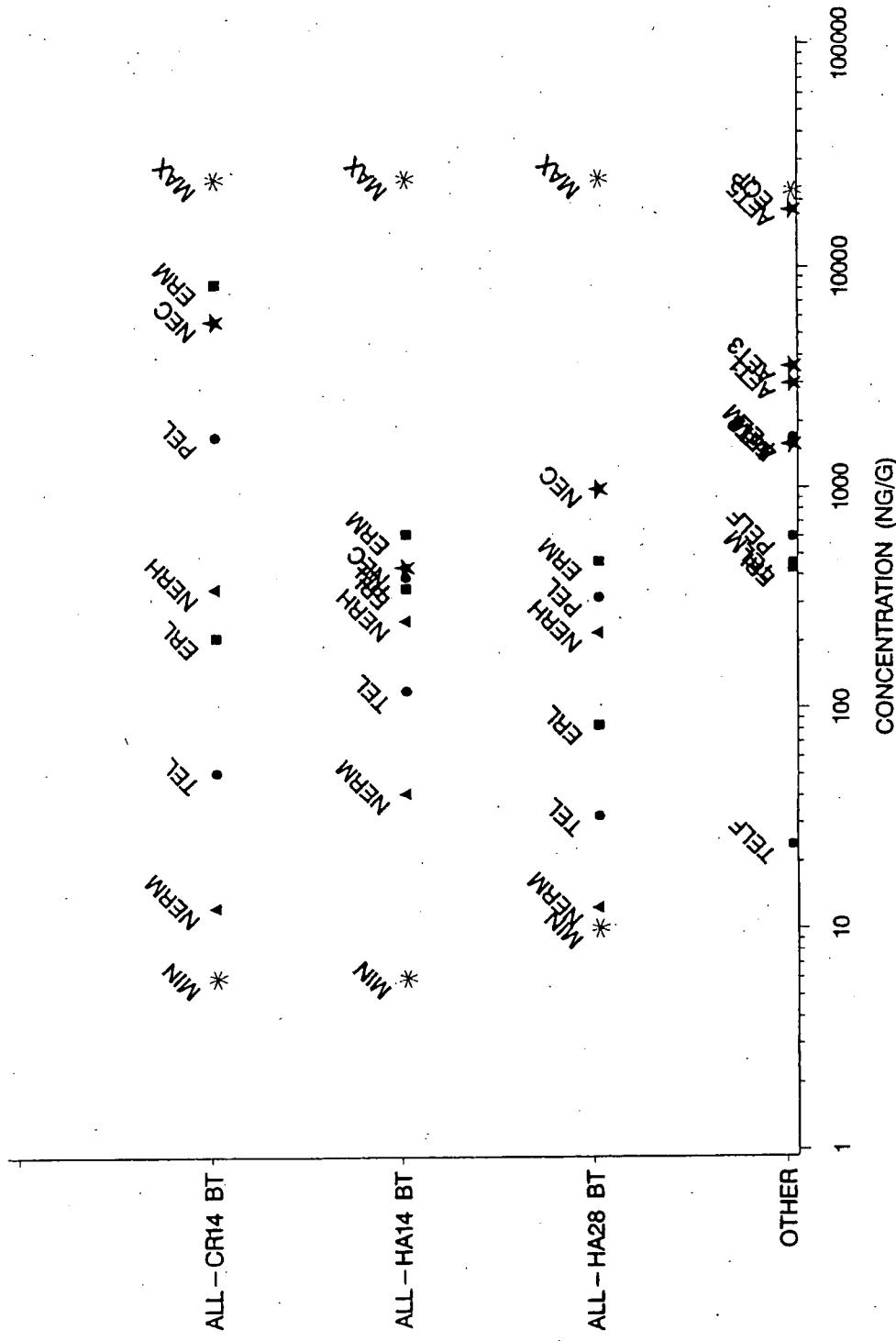


Figure 27

Comparability of our SECs for the entire database to published SECs for benzo[a]pyrene (BaP) based on dry-weight concentrations. Marine ERL and ERM (ERLM and ERM; Long et al., 1995); marine TEL and PEL (TEL and PEL; MacDonald, et al., 1995); freshwater TEL and PEL (TEL and PEL; Smith et al., 1996); (4) marine AETs (AET1 for amphipods, AET2 for oysters, AET3 for Microtox; Barwick et al., 1988); freshwater AETs (AET5 for *Hyalella azteca* and AET6 for Microtox; Batts and Cabbage, 1995 (assumed 2% total organic carbon (TOC)); (6) Screening Level Concentrations (SLC1 for lowest effect level, SLC2 for severe effect level (assumed 2% TOC); Persaud et al., 1992); and (7) EQP (USEPA, 1988; Hoke et al., 1995; assumed 2% TOC).

THRESHOLDS
 FIGURE 28
 CHEMCODE=COPPER

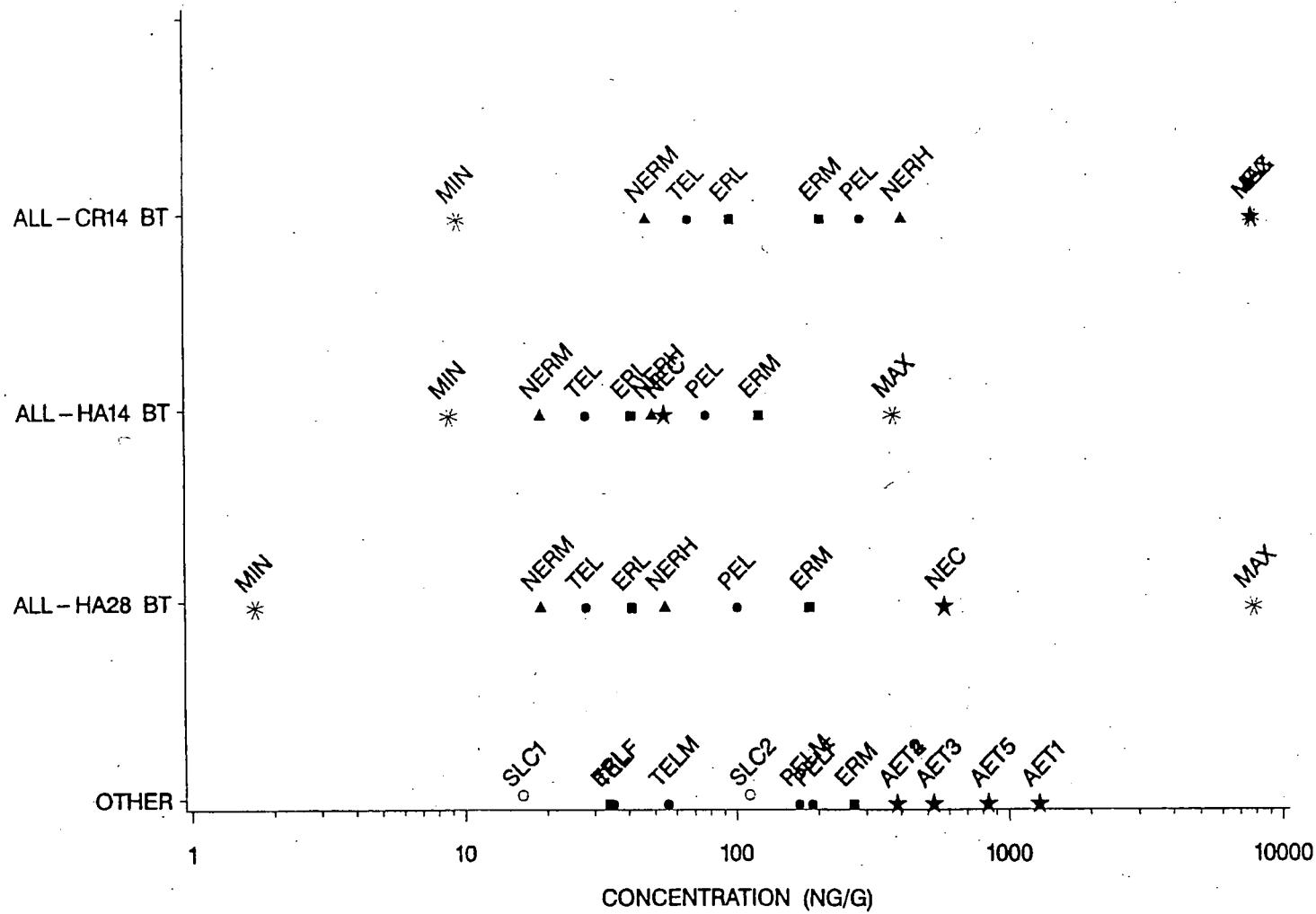


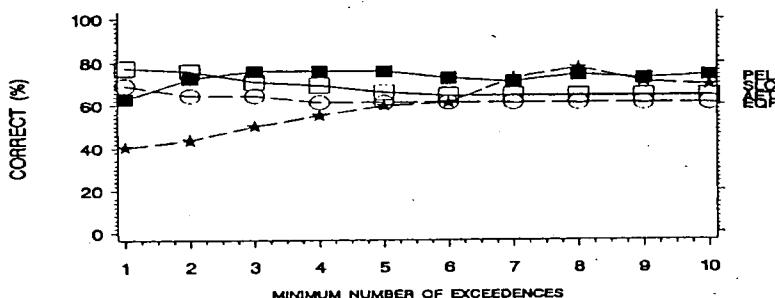
Figure 28

Comparability of our SECs to published SECs for copper based on dry-weight concentrations. See legend of Figure 27 for an description of the abbreviations in Figure 28.

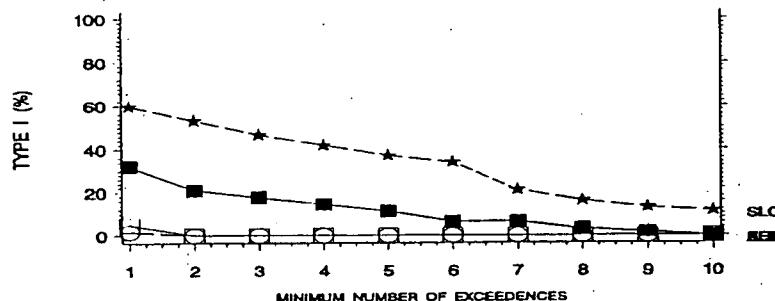
PELF/SLC1/AET5/EQP

FIGURE 29

SAMPTYP = BT TEST = HA28



SAMPTYP = BT TEST = HA28



SAMPTYP = BT TEST = HA28

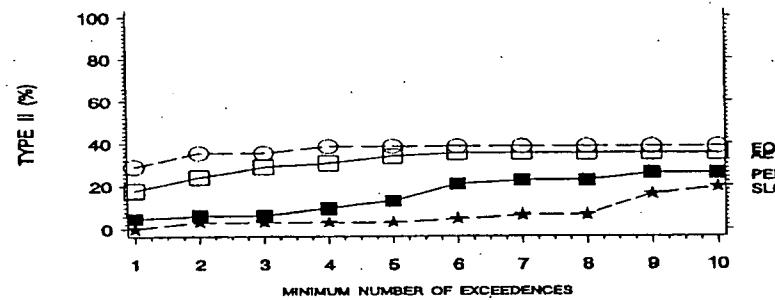


Figure 29

Observed and predicted toxicity of HA28 samples based on dry-weight concentrations and the minimum number of exceedances of published freshwater PELs (PELF; Smith et al., 1996), *Hyalella azteca* AETs (AET5; Batts and Cubbage, 1995; assumed 2% TOC), EQP (USEPA, 1988; Hoke et al., 1995; assumed 2% TOC) and SLCs (SLC1; lowest effect level for Screening Level Concentrations; Persuad et al., 1992). See legend of Figure 21 for a description of Figure 29.

Figure 30: *Hyalina azteca* 28-d test: toxicity vs. ERM

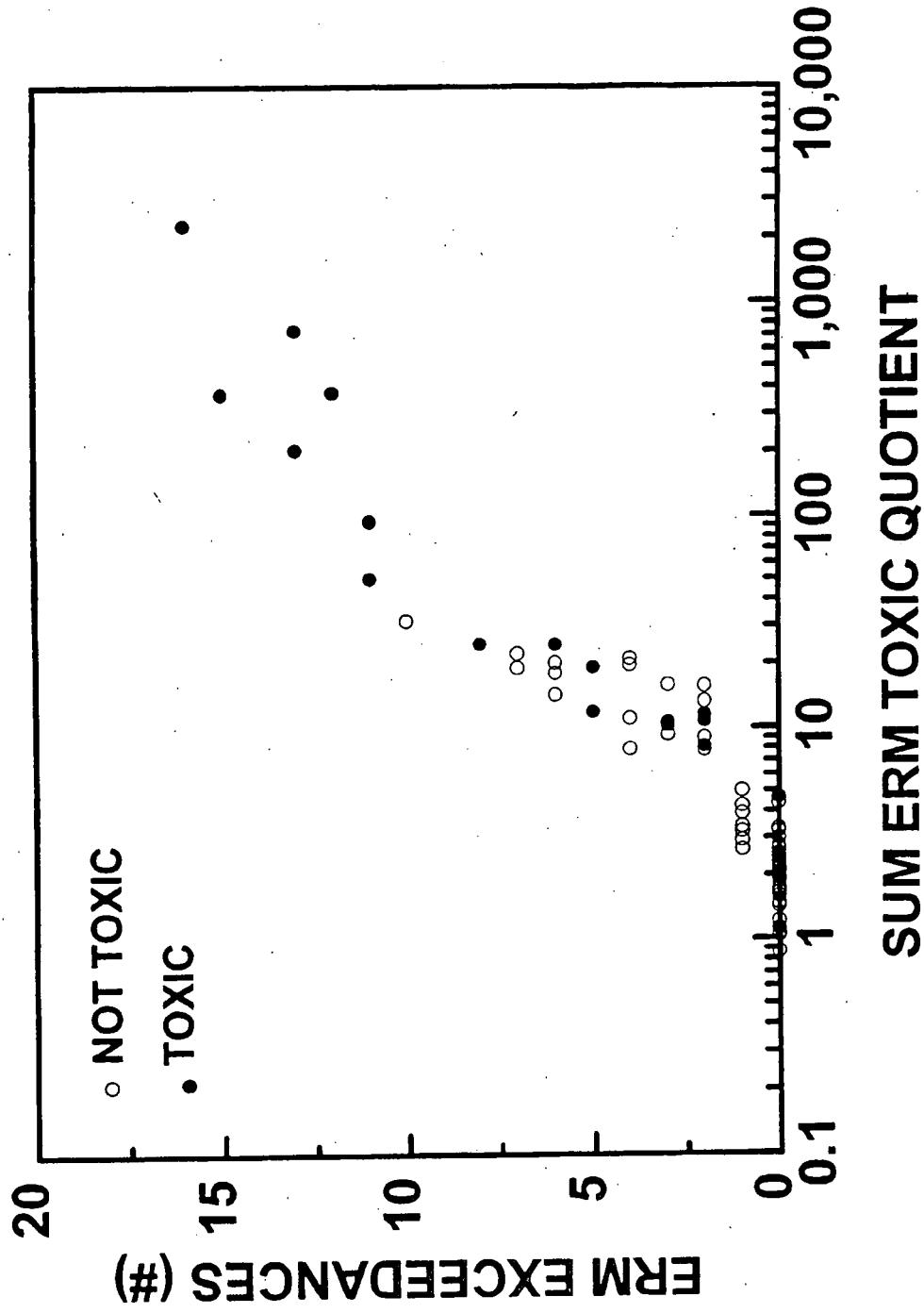


Figure 30

Relationship between the frequency of ERM exceedances and the sum of the ERM toxic quotient for toxic and non-toxic HA28 samples using all ERMs regardless of the percent correct classification using dry-weight concentrations. Adapted from Canfield et al. (1996a,b) and Kemble et al. (1996).